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ATTACHMENT 5

Superfund Record of Decision:
Fairchild Semiconductor (Mt. View), CA
First and Second Remedial Actions
(EPA/ROD/R09-89/030)
June 1989

PB90-118225

United States Environmental Protection Agency
Office of Emergency and Remedial Response
EPA/ROD/R09-89/030
June 1989

EPA

Superfund Record of Decision:

Fairchild Semiconductor (Mt. View), CA

First and Second Remedial Actions

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Fairchild Semiconductor (Mt. View) site is one of three Superfund sites that are being remediated concurrently. The other two sites are Intel (Mountain View Plant) and Raytheon. The sites are located in the Middlefield/Ellis/Whisman (MEW) Study Area in Santa Clara County in the city of Mountain View, California. Land use in the area is primarily light industrial and commercial, with some residential areas. There are no natural surface drainage features within or surrounding the site; most of the runoff is intercepted by a storm drain system and discharged to an offsite creek. Various industrial activities were conducted in the vicinity of the site, including semiconductor manufacturing, metal finishing operations, parts cleaning, aircraft maintenance, and other activities requiring the use, storage, and handling of a variety of chemicals, particularly solvents. Site investigations at several of these facilities during 1981 and 1982 revealed significant soil and ground water contamination by toxic chemicals, primarily VOCs. The primary cause of the contamination was leaking storage tanks and lines, and poor management practices. Before and during additional site investigations, which were conducted under a 1985 Consent Order, interim cleanup activities were conducted at the site by Fairchild, Intel, and Raytheon. These included tank removals, soil removal and treatment, well sealing, construction of slurry walls, and hydraulic control and treatment of local ground water. The primary contaminants of

(See Attached Sheet)

17. Document Analysis a. Descriptors

Record of Decision - Fairchild Semiconductor (Mt. View), CA
First and Second Remedial Actions
Contaminated Media: soil, gw
Key Contaminants: VOCs (PCE, TCE, TCA, toluene, xylenes), organics (phenols)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 95
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

16. Abstract (Continued)

concern affecting the site are VOCs including TCE, TCA, PCE, toluene, and xylenes, and other organics including phenols.

The selected remedy for this site includes in situ vapor extraction with treatment by vapor phase GAC of contaminated soil found within the Fairchild and Raytheon slurry walls. There may be some limited soil excavation and treatment by aeration for some areas outside of the slurry walls, with onsite disposal of residues in the excavated area; ground water pumping and treatment using air stripping, and in some cases liquid phase GAC, with emissions controls consisting of GAC vapor phase carbon units, followed by reuse of the ground water (reuse options including reinjection are being developed) and, if necessary, discharge to surface water; sealing of any conduits or potential conduits to protect the deep aquifer; and ground water monitoring. The present worth cost for this remedial action is $49,000,000 to 56,000,000, which includes O&M costs.

FAIRCHILD, INTEL, AND RAYTHEON SITES
MIDDLEFIELD/ELLIS/WHISMAN (MEW) STUDY AREA
MOUNTAIN VIEW, CALIFORNIA

MEW

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United States Environmental Protection Agency

Region IX -- San Francisco, California

May 1989

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RECORD OF DECISION

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RECORD OF DECISION

DECLARATION

Site Name and Location

Fairchild, Intel and Raytheon Sites, Middlefield/Ellis/Whisman (MEW) Study Area, Mountain View, California

Statement of Basis and Purpose

This decision document presents the selected soil and groundwater remedial actions for the Fairchild, Intel, and Raytheon National Priority List (NPL) Sites in the Middlefield/Ellis/Whisman (MEW) Study Area of Mountain View, California. The selected remedial actions will also apply to the area-wide groundwater contamination and to other areas of soil contamination in the MEW Study Area, as appropriate. The remedial actions have been developed in accordance with the Comprehensive Environmental Response, Liability, and Compensation Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the maximum extent practicable, the National Contingency Plan (NCP). This decision is based upon the administrative record for this site. The attached index identifies the items which comprise the administrative record upon which the selection of the remedial actions are based.

Description of the Remedies

The selected soil remedy is in-situ vapor extraction with treatment by vapor phase granular activated carbon, and excavation with treatment by aeration. Most of the vapor extraction will take place within the existing Fairchild and Raytheon slurry walls which contain the bulk of the site soil contamination. Several smaller areas outside of the slurry walls will also be remediated by in-situ vapor extraction. The cleanup goals for soils are 1 part per million (ppm) trichloroethene (TCE) inside the slurry walls and 0.5 ppm TCE outside of the slurry walls. The soil cleanup goal is based on the amount of contamination that can remain in the soil and still maintain the groundwater cleanup goal in the shallow aquifers (outside the slurry walls). Further explanation of the different cleanup goals is provided on page 22 of this document, in Section 13 on The Selected Remedies.

The groundwater remedy is extraction and treatment. Extracted groundwater will be treated by air stripping towers. Airborne emissions will meet all Bay Area Air Quality Management District emission standards. It is anticipated that emission controls by granular activated carbon will be required once the full remedy is implemented. The extracted groundwater will be reused to the maximum extent feasible, with a goal of 100% reuse. Extracted water which cannot be reused will be discharged to local streams. Allowable discharges to local streams will be regulated by the National Pollutant Discharge Elimination System (NPDES) of the Clean Water Act.

The groundwater cleanup goals are 5 parts per billion (ppb) TCE for the shallow aquifers (which are not currently used for drinking water) and 0.8 ppb TCE for the deep aquifers which are used for drinking water. Attainment of these levels will also assure cleanup of the other volatile organic compounds to at least their respective Maximum Contaminant Levels (MCLs). The shallow aquifer cleanup goals also apply to the aquifers inside the slurry walls.

The remedy includes the identification and sealing of any potential conduit wells. Several abandoned agriculture wells which acted as conduits for contamination to migrate from the shallow aquifers to the deep aquifers have already been sealed. Additional wells have been identified for sealing and others may be identified which will also require sealing.

The remedy also includes maintaining inward and upward hydraulic gradients (by pumping and treatment) inside the slurry walls and regular monitoring of aquifers within and adjacent to the slurry walls to monitor the integrity of each slurry wall system. Maintaining inward and upward hydraulic gradients will control contaminants from escaping due to slurry wall failure. Selected wells will be monitored for chemical concentrations and water levels.

The soil remedy is expected to be in operation between 1 to 6 years. The groundwater remedy for the shallow aquifers may be in operation for as long as 46 years or into the indefinite future, because of the physical and chemical nature of the aquifers. The groundwater remedy for the deep aquifers is estimated to be in operation for at least 2 years and possibly as long as 45 years. There will be regular monitoring of the groundwater and slurry walls during the life of the remedy.

Declaration

The selected remedies are protective of human health and the environment, attain Federal and State requirements that are applicable or relevant and appropriate to the remedial actions, and are cost-effective. With respect to contamination in groundwater and soil, the statutory preference for remedies that employ treatment, reduce toxicity, mobility or volume as a principal element, and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable is satisfied.

Because of the anticipated length of time to achieve the cleanup goals and the uncertainty whether the cleanup goals can be achieved, both the technologies and the cleanup goals will be reassessed every 5 years.

Daniel W. McGovern

Daniel W. McGovern
Regional Administrator

RECORD OF DECISION

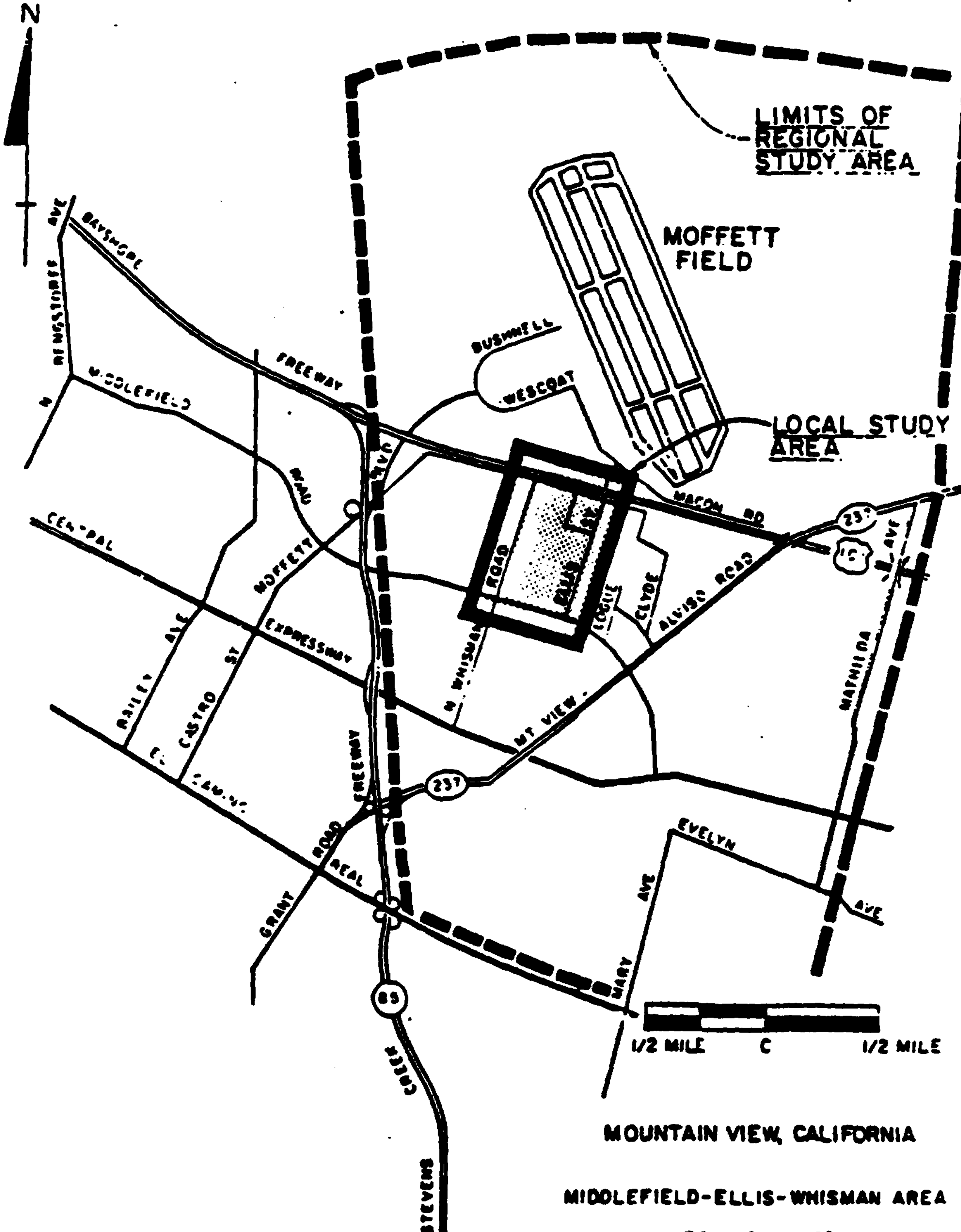
DECISION SUMMARY

1.0 SITE LOCATION AND DESCRIPTION

The Middlefield/Ellis/Whisman (MEW) Study Area is located in Santa Clara County in the city of Mountain View, California. The site is divided into a Local Study Area (LSA) and a Regional Study Area (RSA). Figure 1-1 identifies the LSA and RSA, along with local roads and landmarks. The LSA consists of three National Priority List (NPL) sites (Fairchild, Intel and Raytheon), as well as several non-Superfund sites. The LSA encompasses about 1/2 square mile of the RSA and contains primarily light industrial and commercial areas, with some residential areas west of Whisman Road. The RSA encompasses approximately 8 square miles and includes Moffett Naval Air Station (an NPL site) and NASA Ames Research Center, along with light industrial, commercial, agricultural, park, golf course, undeveloped land, residential, motel and school land uses.

Various owners or occupants in the area around the intersections of Middlefield Road, Ellis Street, Whisman Road, and the Bayshore Freeway (U.S. Highway 101), are or were involved in the manufacture of semiconductors, metal finishing operations, parts cleaning, aircraft maintenance, and other activities requiring the use of a variety of chemicals. Local facilities with current occupants are presented on Figure 1-2. Site investigations at several of these facilities have revealed the presence of toxic chemicals in the subsurface soils and groundwater. To investigate the extent of groundwater contamination emanating from the LSA, and soil contamination at their respective facilities, Fairchild, Intel, and Raytheon performed a Remedial Investigation and a Feasibility Study of potential remedial alternatives under the direction of EPA.

There are no natural surface drainage features within the Local Study Area. The nearest significant natural surface drainage features of the Regional Study Area are Stevens Creek to the west and Calabazas Creek to the east. Calabazas Creek is located approximately four miles east of the MEW Study Area. Stevens Creek forms the western boundary of the Regional Study Area. Both discharge into the San Francisco Bay. Surface water runoff from most of the RSA and all of the LSA south of the Bayshore Freeway is intercepted by a storm drain system and is discharged into Stevens Creek. To the north of the Bayshore Freeway, most of the runoff from Moffett Field Naval Air Station is collected by a storm drain system that ultimately discharges to Guadalupe Slough of San Francisco Bay. Runoff from the northwestern portion of Moffett Field discharges into Stevens Creek.



Site Location

Figure 1-1

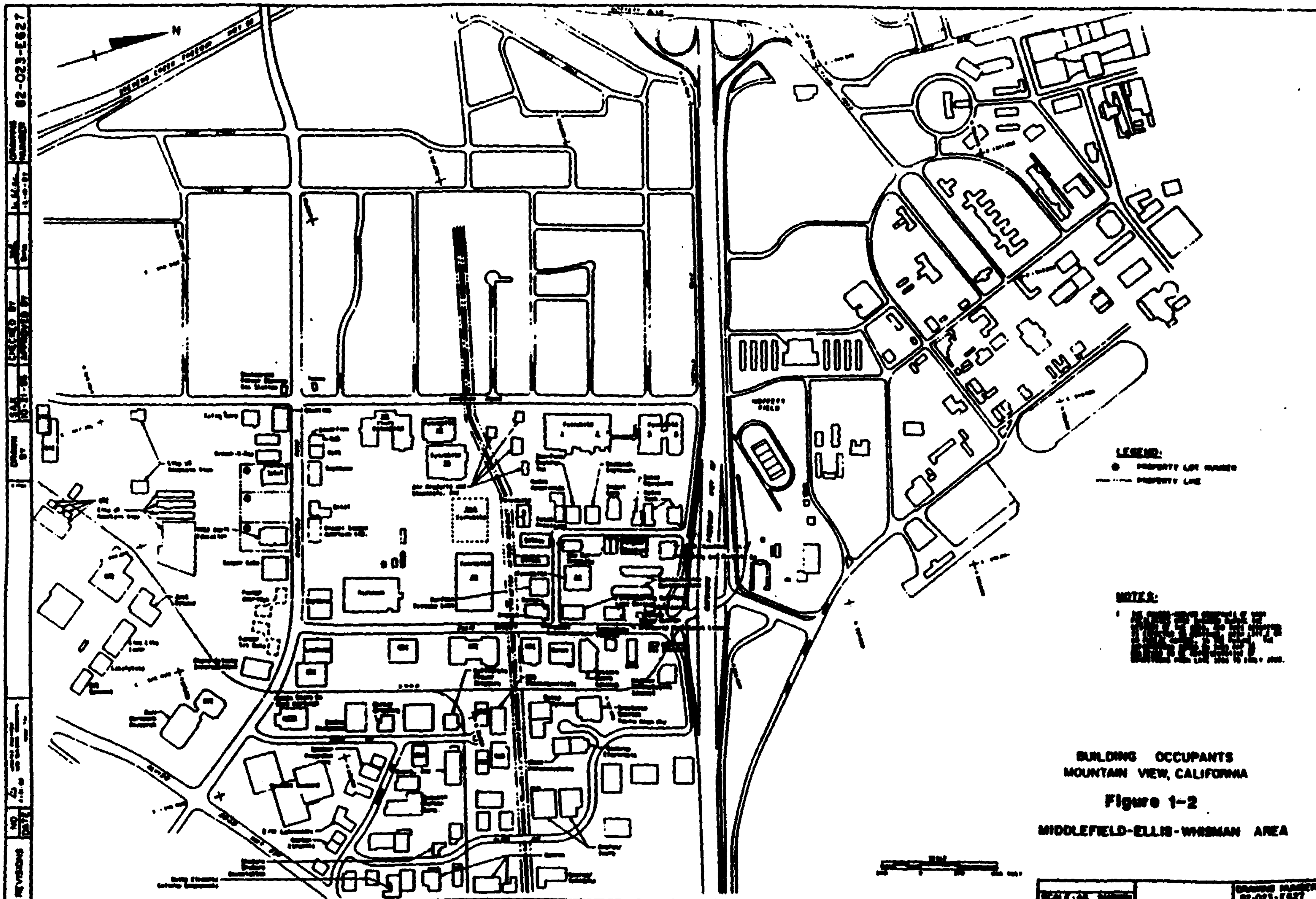
The Local and Regional Study Areas are underlain by a thick sequence of unconsolidated sediments deposited into a structural depression. The sediments are comprised of alluvial fan, estuarine, and bay mud deposits. Repeated variations in sea levels resulted in a complex sedimentary sequence characterized by irregular interbedding and interfingering of coarse and fine grained deposits.

Groundwater aquifers at the site are subdivided into shallow and deep aquifer systems, separated by a laterally extensive regional aquitard. The shallow aquifer system comprises aquifers and aquitards to a depth of approximately 160 feet below the surface. Within the shallow system four primary hydrogeologic aquifer zones have been identified based upon the occurrence of aquifer material and a similar depth below the surface. The shallow aquifer system is comprised of the A-aquifer and the underlying B1-, B2- and B3- aquifers. The regional B-C aquitard separates the B3-aquifers from the C-aquifer and the deep aquifer system. Current groundwater flow in aquifer zones above the B-C aquitard is generally to the north, toward San Francisco Bay.

2.0 SITE HISTORY

During 1981 and 1982, preliminary investigations of facilities within the LSA indicated significant concentrations of contaminants in soil and groundwater. By 1984, the Fairchild, Intel and Raytheon sites, located within the LSA, were proposed for the Federal National Priorities List (NPL). By 1985, five companies within the LSA (Fairchild, Intel, Raytheon, NEC, and Siltec) initiated a joint investigation to document and characterize the distribution of chemicals emanating from their facilities. In April 1985, the California Regional Water Quality Control Board - San Francisco Bay Region (RWQCB) adopted Waste Discharge Requirements (WDRs) for each of the five companies. The primary cause of the subsurface contamination was from leaking storage tanks and lines, and poor waste management practices.

On August 15, 1985, Fairchild, Intel, and Raytheon entered into a Consent Order with the EPA, the RWQCB, and the California Department of Health Services (DHS). Since signing of the Consent Order, the three companies have carried out an extensive Remedial Investigation and Feasibility Study (RI/FS) of chemicals emanating from the LSA and soil contamination at their respective facilities. Work has been performed under the supervision of EPA, the RWQCB, DHS, and the Santa Clara Valley Water District (SCVWD). Prior to and during the site investigation, the companies have been conducting interim clean up activities at the site. These interim remedial actions include tank removals, soil removal and treatment, well sealing, construction of slurry



BUILDING OCCUPANTS
MOUNTAIN VIEW, CALIFORNIA

Figure 1-2

MIDDLEFIELD-ELLIS-WHISMAN AREA

walls, and hydraulic control and treatment of local groundwater. NEC and Siltec declined to enter into the Consent Order and were placed under RWQCB enforcement authority.

The three companies followed an approved Quality Assurance and Quality Control (QA/QC) Plan and approved Sampling Plans. In addition, split samples were collected by EPA from selected wells and these results were compared with the companies' sampling results. EPA determined that the companies' data quality was adequate for the purpose of the RI/FS.

The MEW Remedial Investigation Report was concluded in July, 1988. The draft Feasibility Study and EPA's Proposed Plan were presented to the community for review and public comment in November, 1988. In May 1989, Special Notice letters for the Remedial Design/Remedial Action (RD/RA) Consent Decree were sent out to the five (5) original companies and twelve (12) other Potentially Responsible Parties (PRPs).

3.0 ENFORCEMENT

The Regional Water Quality Control Board - San Francisco Bay Region (RWQCB) was the lead agency until April 1985, when the Board referred the five companies to EPA for cleanup under Superfund. In May, 1985, EPA sent general notice letters, pursuant to Section 106 of CERCLA, to the five companies. NEC and Siltec chose not to participate in the RI/FS negotiations and were referred back to the RWQCB. In August 1985, Fairchild, Intel, and Raytheon signed an Administrative Order on Consent with EPA, to conduct an RI/FS of the MEW area. The RWQCB and California Department of Health Services were cosignees of the Consent Order.

The Consent Order and Work Plan called for a comprehensive groundwater investigation of the MEW area and site specific (source) investigation at Fairchild, Intel, and Raytheon. The RWQCB issued Waste Discharge Requirements (WDRs) for NEC and Siltec which paralleled the Consent Order schedule and requirements.

During the course of the RI/FS, EPA gathered new information and evaluated existing information concerning other PRPs.

During December 1987 and January 1988, EPA issued twenty-four (24) RCRA 3007/CERCLA 104 information request letters to various other parties in the MEW area. In July 1988, EPA issued a RCRA 3013 Unilateral Order to GTE to begin an investigation of its property, to determine if the company had contributed to the MEW groundwater plume. After evaluating the 3007/104 response letters, EPA sent General Notice Letters to seventeen (17) PRPs in September 1988. An initial PRP meeting was sponsored by EPA in October 1988, to explain the Superfund process to the noticed PRPs. EPA issued seven (7) additional General Notice and/or information request letters in March 1989. EPA subsequently issued Special Notice Letters for conducting the selected remedies in May 1989.

4.0 COMMUNITY RELATIONS

The comment period for the Proposed Plan opened November 21, 1988, and closed January 23, 1989. A public meeting was held on December 14, 1988 at the Crittenden Middle School in Mountain View and was attended by approximately 75 people.

Prior to the beginning of the public comment period, EPA published notices in "The View", "The Los Altos Town Crier", "The Times Tribune", and the "San Jose Mercury News" (Peninsula Extra Edition). The notices briefly described the Proposed Plan and announced the public comment period and the public meeting. The notice also announced the availability of the Proposed Plan for review at the information repository established at the Mountain View Public Library.

A fact sheet describing the Proposed Plan was delivered to the Mountain View Public Library in November, 1988. Copies of the fact sheet were also mailed in November, 1988 to EPA's MEW mailing list, which contains members of the general public, elected officials, and PRPs.

In addition, EPA held several workshops and briefings in November and December, 1988 for various community groups, the Mountain View City Council, and the Santa Clara County Board of Supervisors. The workshops were used to brief community groups and elected officials on the results of the MEW RI/FS and to describe EPA's proposed remedial alternatives.

EPA has prepared the attached response summary, which provides Agency responses to comments submitted in writing during the public comment period. Also attached is a transcript of the proceedings of the December 14, 1988 community meeting.

5.0 DECISION SCOPE

As discussed in the Declaration and Site History, the selected remedial actions that are presented in this decision document are designed to protect the local drinking water supplies, restore the shallow, and deep aquifers to meet MCLs and a 10^{-6} risk level respectively, control and remediate contamination in subsurface soils, and prevent vertical migration of contamination in the aquifers. The difference in decision on cleanup goals for the shallow and deep aquifers is provided on page 22 of this document, in Section 13 on The Selected Remedies.

The remedial actions, pumping and treating groundwater and conduit sealing, will address the area-wide groundwater contamination. The remedial actions, in-situ soil vapor extraction, and excavation and treatment will address soil contamination at the Fairchild, Intel, and Raytheon NPL sites and other areas of soil contamination identified in the MEW Study Area.

6.0 NATURE AND EXTENT OF CONTAMINATION

Industrial activities conducted within the MEW Study Area required the storage, handling and use of a large number of chemicals, particularly solvents and other chemicals used in a variety of manufacturing processes. Significant quantities of volatile organic chemicals were used for degreasing, process operations, and for general maintenance. Raw and waste solvents and other chemicals were piped and stored in underground systems. The presence of chemicals in the subsurface soils and groundwater, that originated from facilities in the MEW area, are primarily the result of leaks from these subsurface tanks and lines, sumps, chemical handling and storage areas, and utility corridors. Chemical releases occurred, for the most part, below the ground surface and migrated downward into the aquifer system.

Investigations at the site have revealed the presence of over 70 compounds in groundwater, surface water, sediments, and subsurface soils. The vast majority and quantity of these compounds are found in groundwater and subsurface soils. Three major classes of chemicals were investigated during the RI: (1) volatile organic compounds, (2) semi-volatile acid and base/neutral extractable organic compounds, and (3) priority pollutant metals. Of these three classes, volatile organics are the most prevalent. Table 6-1 presents chemicals of concern, frequency of detection, and maximum concentrations.

An extensive area of groundwater contamination has been defined in the RI and is presented in Figure 6-1. Current site data indicate that chemicals are present primarily in the A-, B1-, and B2-aquifer zones. To a much lesser degree, chemicals have been detected in localized areas of the B3-, C-aquifer, and deeper aquifer zones. Contamination of the C-aquifer and deeper aquifers appears to have resulted from chemicals migrating downward from shallow areas containing elevated chemical concentrations, through conduit wells, into groundwater of the deep aquifer system. The C and Deep aquifers most affected by contamination

TABLE 6-1

CHEMICALS OF CONCERN
MIDDLEFIELD/ELLIS/WHISMAN STUDY AREA

Chemical	Frequency of Detection[a]	Geometric Mean Concentration[b] (mg/liter)	Maximum Concentration[b] (mg/liter)
<u>Organics</u>			
Chloroform	71/384	0.002	3.3
1,2-Dichlorobenzene	13/384	0.003	5.2
1,1-Dichloroethane	98/384	0.005	10.0
1,1-Dichloroethene	153/384	0.006	20.0
1,2-Dichloroethene	200/384	0.030	330.0
Freon-113	181/384	0.009	46.0
Phenol	21/273	0.002	50.0
Tetrachloroethene	64/384	0.003	3.7
1,1,1-Trichloroethane	184/384	0.017	420.0
Trichloroethene	278/384	0.175	1000.0
Vinyl Chloride	17/384	0.008	25.0
<u>Inorganics</u>			
Antimony	15/205	0.052	0.600
Cadmium	26/205	0.006	0.050
Arsenic	34/292	0.004	0.040
Lead	44/292	0.002	0.043

a/ Values for organics are number of detects/number of samples for the fourth round of groundwater sampling. Values for inorganics are the number of detects/number of well sampled for dissolved metals.

b/ Values reported are for all groundwater samples for each chemical.

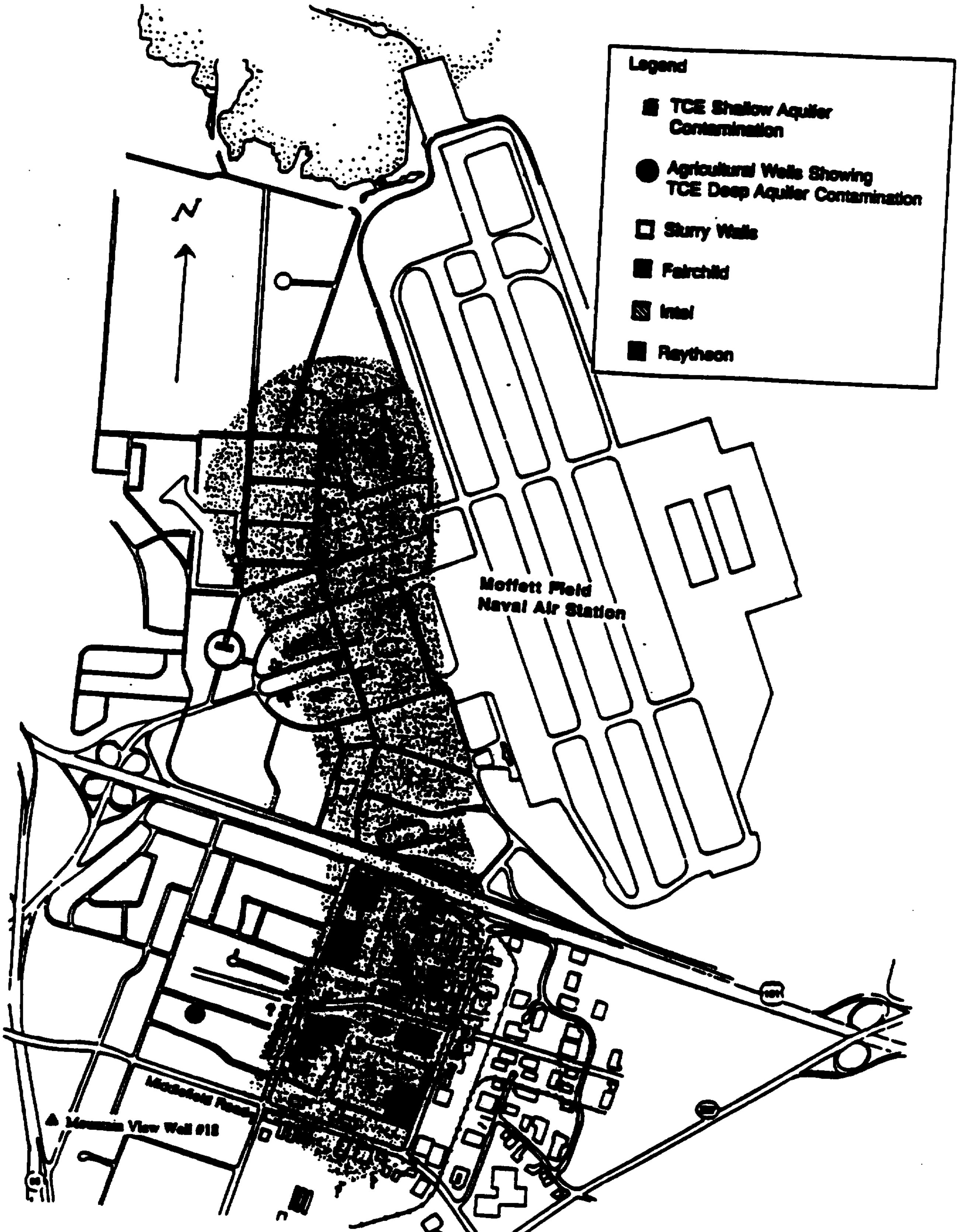
are in the areas of the so-called Rezendes Wells, located near Fairchild Building 20, and the Silva Well, located at 42 Sherland Avenue. These wells have subsequently been sealed. The closest municipal water supply well, Mountain View #18 (MV 18), is located approximately 1800 feet to the southwest of the Silva Well. Groundwater samples are collected from MV 18 on a regular basis. No contaminants have been identified in any water samples from MV 18. As part of the Remedial Design and Remedial Action (RD/RA) some additional groundwater investigations may be necessary, particularly in the Silva Well area.

Subsurface soil contamination has been found at the Fairchild, Intel, and Raytheon facilities, along with the facilities of other PRPs within the RSA. Trichloroethene (TCE), 1,1,1-trichloroethane (TCA), trichlorotrifluoroethane (Freon-113), 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethene (1,2-DCE), methylene chloride, toluene, acetone, and xylene are the chemicals most commonly detected in subsurface soils in the LSA. Chemicals associated with activities in the RSA appear to be concentrated in shallow soils above approximately 50 feet or roughly extending to the B1-aquifer. Chemicals are not found in surface soil samples (upper one foot of soil) and do not appear in soils and clay of the B-C aquitard. Chemical found in subsurface soil samples are generally similar to those found in adjacent groundwater samples. As part of the Remedial Design and Remedial Action some additional soil investigations may be necessary in certain areas.

7.0 BASELINE SITE RISKS

An Endangerment Assessment prepared by EPA as part of the RI/FS was used to evaluate the ramifications of the no-action remedial alternative and to determine if an actual or threatened release of a hazardous substance from the site may present an imminent or substantial endangerment to public health, welfare, or the environment.

Large areas of the site are contaminated. The bulk of the contamination is present in groundwater and subsurface soils. Investigations at the site have revealed the presence of over 70 compounds. Because of the large number of chemicals detected at the site, a selection process was used to determine the chemicals of primary concern at the site. The organic chemicals that were selected are: trichloroethylene, 1,1,1,-trichloroethane, vinyl chloride, 1,1-dichloroethane, 1-,1-dichloroethylene, 1,2-dichloroethylene (cis and trans isomers), dichlorobenzene, chloroform, Freon 113, tetrachloroethylene, and phenol. Metals were detected infrequently. Overall metals are of less concern at the site that the volatile organic chemicals. Several of the selected contaminants (trichloroethylene, chloroform,



Location of MEW Plume

Figure 6-1

7d

dichlorobenzene, tetrachloroethylene) have been shown to be carcinogenic in animals and have been classified by EPA as possible or probable human carcinogens. Vinyl chloride is a known human carcinogen. The other contaminants have been shown to cause systemic toxicity under certain exposure conditions.

The results of the Endangerment Assessment indicate that exposure to contaminated groundwater poses the greatest public health concern. Risks to public health were estimated by combining information on exposure at possible exposure points with toxic potency of the groundwater contaminants. Drinking water from hypothetical wells to the west of Whisman Road for a lifetime would be associated with an upperbound excess lifetime cancer risk of $6(10)^{-3}$ (average case) and $2(10)^{-2}$ (maximum case). Drinking water from a well to the north of the LSA in the A-aquifer would be associated with an upperbound excess lifetime cancer risk of $9(10)^{-3}$ (average case) and $4(10)^{-2}$ (maximum case). Drinking water from a B1-aquifer well in the same area would pose an upperbound excess lifetime cancer risk of $1(10)^{-2}$ (average case) and $5(10)^{-2}$ (maximum case). In addition, estimated intake of noncarcinogenic compounds from groundwater at these locations would exceed reference dose levels (RfDs).

Contaminants are not present at elevated levels in exposed surface soils. Consequently, substantial exposure via direct contact with contaminated soils or via inhalation of volatile compounds from soil or contaminated fugitive dust is considered unlikely under current land-use conditions. If redevelopment of the site was to occur for residential or other uses, significant exposure to contaminants can occur if localized areas of contamination remained uncovered. Short-term excavation activities at the site could lead to inhalation of volatile organic compounds or contaminated fugitive dust, but exposure would probably be of short duration and frequency, and therefore would not pose a significant public health concern.

Low concentration-levels of several chemicals were detected in Stevens Creek, at the western boundary of the RSA. Any exposure to these chemicals would probably be of short duration and frequency, and therefore the risk would be negligible.

The Endangerment Assessment also indicates that "environmental" (flora and fauna) exposure to chemicals from the MEW site is negligible.

In summary, the results of the baseline risk assessment for the no-action alternative indicate that exposure to contaminants in groundwater poses the greatest <u>potential</u> public health concern.

8.0 CHANGES TO THE PROPOSED PLAN

1. The Proposed Plan identifies vapor extraction as the preferred alternative to address contaminated soils. However, because soil excavation and treatment by aeration has been effectively implemented at MEW in the past (at Intel), and other PRPs have expressed interest in exploring this alternative for their sites, the selected remedy for soils will also allow soil excavation to be implemented, provided federal, state, and local air standards can be met. In addition to local air standards, Best Demonstrated Available Technology (BDAT) treatment standards may also be required depending upon how the excavated soil is handled. The addition of soil excavation and treatment by aeration allows flexibility during the RD/RA phases for other PRPs to use a cost effective alternative for their particular sites while also protecting human health and the environment. Soil excavation and treatment by aeration would most likely be suitable for small localized areas of contamination.

2. The Proposed Plan appears to be ambiguous in the cleanup goal for aquifers within the slurry walls. While the Proposed Plan cleanup goal for the shallow aquifers is 5 ppb for TCE, however, the plan also states that the shallow aquifer zone is defined as those shallow aquifers located outside the slurry walls.

   Although the aquifers confined by the slurry walls are disconnected from the outside aquifers (when hydraulic control is maintained by pumping aquifers inside the slurry walls) a cleanup goal of 5 ppb for TCE (the MCL) will also be established for aquifers inside the slurry walls. This goal is more protective of the public health and the environment and is consistent with cleanup goals set by the RWQCB for another site in Santa Clara Valley.

3. Identification and sealing of potential conduits was discussed in text of the Feasibility Study (FS) and in Appendix L of the FS, but not specifically noted in EPA's Proposed Plan. Potential conduits will be identified, evaluated, and sealed if necessary.

9.0 DESCRIPTION OF ALTERNATIVES

The MEW Feasibility Study identified an array of remediation technologies that were potentially applicable and then screened those technologies based on their applicability to site characteristics, compatibility with site-specific chemicals, and anticipated performance. After the technology screening process, alternatives were formulated using combinations of feasible technologies that are capable of meeting remedial objectives. These alternatives were evaluated based on their public health and environmental impacts and on order of magnitude cost considerations. The short- and long-term effectiveness of each alternative was also assessed. After this initial screening of remedial alternatives, a detailed analysis of the selected alternatives was performed. This section of the Record of Decision will present the alternatives evaluated in the detailed analysis of remedial alternatives.

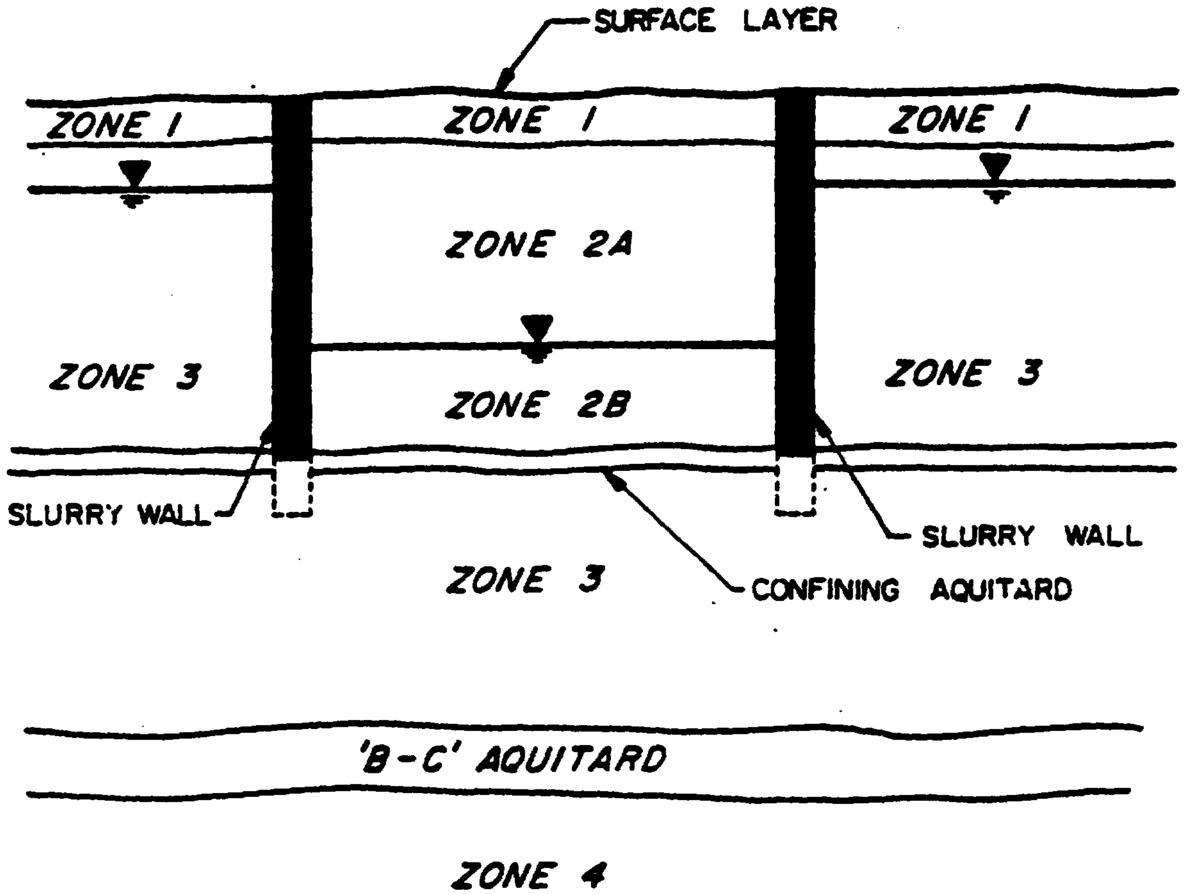
To evaluate the remedial alternatives, the MEW Study Area was divided into five subsurface zones, as show in Figure 9-1. The first subsurface zone (Zone 1, the "cohesive shallow layer") consists of soil stratum that begins at the ground surface and extends to the water table. The upper foot of the cohesive shallow layer is not included in the analysis of alternatives based upon the conclusion set forth in the Endangerment Assessment that there are no health risks from exposure to surface soils. The second subsurface zone (Zone 2A, the "unsaturated disconnected aquifers") consists of the unsaturated zone within the area bounded by the existing slurry walls. The Fairchild slurry walls extend into the A/B aquitard. The Raytheon slurry wall extends through the A/B and B1/B2 aquitards and into the B2 aquifer. The third subsurface zone (Zone 2B, the "saturated disconnected aquifers") consists of the saturated zone within the slurry walls. The fourth subsurface zone (Zone 3, the "shallow aquifers") consists of the shallow aquifer system outside of the slurry walls. The fifth subsurface zone (Zone 4, the "deep aquifers") consists of the C-aquifer and deeper aquifer zones.

The range of potential remedial alternatives are presented for each subsurface zone: Zone 1 Soils; Zone 3 Shallow Aquifers; Zone 4 Deep Aquifers; and Zones 2A and 2B Slurry Wall System.

Zone 1 - Soils

No Further Action:

The No Action alternative serves as a "baseline" against which other alternatives are compared. For soils, only soil monitoring would be conducted, and all soil pilot study activities would be discontinued.



LEGEND:

GROUND WATER LEVEL

SLURRY WALL EXTENSION THROUGH AQUITARD

ZONE DEFINITIONS:

ZONE 1 — COHESIVE SHALLOW LAYER

ZONE 2A — UNSATURATED DISCONNECTED AQUIFERS

ZONE 2B — SATURATED DISCONNECTED AQUIFERS

ZONE 3 — SHALLOW AQUIFERS

ZONE 4 — DEEP AQUIFERS

SCHEMATIC OF SUBSURFACE ZONES AT MEW SITE
SLURRY WALL
MOUNTAIN VIEW, CALIFORNIA
PREPARED FOR
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
MIDDLEFIELD-ELLIS-WHISMAN AREA

Figure 9-1

In-Situ Vapor Extraction and Treatment:

Soil vapor extraction involves removing the volatile soil contaminants without excavating the soil itself. This would be accomplished by installing vapor extraction wells through which air containing Volatile Organic Compounds (VOCs) is pumped from the soil. Contaminants in the extracted air are then removed using carbon treatment, if necessary, and the treated air is released. The treatment process is designed to meet all applicable air emission standards.

Partial Excavation and Ambient Temperature Aeration:

This alternative involves excavating and aerating the soil, which causes the VOCs to volatilize. Treated soils are then placed back in their original locations. The areas that would be excavated are those with the highest level of contamination. Treatment by ambient temperature aeration would be conducted inside a controlled atmosphere enclosure where necessary. This enclosure would prevent the migration of fugitive dust and chemicals vapors from the treatment area. Chemical vapors would be captured by activated carbon, if necessary. The primary disadvantages of this alternative are that soils located under buildings and other structures could not be excavated and treatment of the air emissions is difficult.

Partial Excavation and Ambient Temperature Aeration with In-Situ Vapor Extraction:

This alternative involves a combination of the previous two cleanup alternatives. Excavation and aeration would be used at those soil contamination zones that are accessible. Vapor extraction would be used for selected contamination zones that are not easily accessible, such as soil contamination zones located under buildings.

Zone 3 - Shallow Aquifers

No Further Action:

The No Action alternative for the shallow aquifers would involve only groundwater monitoring; no additional cleanup activities would be conducted.

Hydraulic Control by Groundwater Extraction and Treatment:

This alternative involves low-rate pumping of the affected aquifers with monitoring of the plume, and represents the lowest level of active restoration evaluated for the shallow groundwater system. Recovery wells would be installed in appropriate locations along the periphery of the plume. The extraction well would operate at a pumping rate sufficient to insure that the plume would not expand laterally. Extracted groundwater would be treated using air stripper-based treatment systems and vapor-phase carbon adsorption (where necessary) which would be operated under applicable air and water quality requirements. The treated water would be discharged to Stevens Creek via the storm sewer system. A network of monitoring wells would be used to determine any changes in the extent of the plume.

Hydraulic Remediation by Groundwater Extraction and Treatment:

This alternative involves pumping the affected aquifers at a rate sufficient to achieve an accelerated reduction in the extent of the plume and reduction of chemical concentrations in the groundwater. This alternative would also utilize a network of monitoring wells to verify remediation progress. Extraction wells would be installed in locations around the periphery and in the plume. Extracted groundwater would be treated using air stripper-based treatment systems and vapor-phase carbon adsorption if necessary, which would be operated to meet applicable air emission limitations. Treated water would be discharged to Stevens Creek via the storm sewer system.

Vertical Impermeable Barriers:

This alternative involves constructing a vertical impermeable barrier around the entire MEW plume, in order to hydraulically isolate the shallow aquifers. This alternative would not result in a permanent reduction of chemicals currently in the shallow aquifer system, unless implemented in conjunction with other remedial alternatives.

<u>Zone 4 - Deep Aquifers</u>

No Further Action:

The No Action alternative, which is used as a baseline for evaluation of remedial alternatives, consists of monitoring the existing groundwater plume.

Hydraulic Remediation by Groundwater Extraction and Treatment:

Elements of this alternative are described above for shallow aquifers and are essentially the same for the deep aquifers.

<u>Zone 2A - Unsaturated Disconnected Aquifers (Slurry Wall System)</u>

No Further Action:

The No Action alternative involves no further treatment of Zone 2A soils, located within the area bounded by the existing slurry walls. Under this alternative, the unsaturated disconnected aquifer soils would remain contained laterally by the slurry cutoff walls. Long-term monitoring of water levels and chemical concentrations in the saturated disconnected aquifers (Zone 2B) and the shallow aquifer (Zone 3) water-bearing zones outside (beneath and around) the slurry walls would be required to detect migration of chemicals from the unsaturated soils within the slurry walls.

In-Situ Vapor Extraction:

This alternative for remediation of the unsaturated disconnected aquifer soils involves aerating the Zone 2A soils by vacuum extraction, treating the extracted air in accordance with applicable air quality requirements. Extracted volatiles would pass through an emission control system consisting of vapor-phase carbon adsorption for removal of the VOCs from the extracted air prior to discharge to the atmosphere in accordance with appropriate air requirements. This alternative would also use existing extraction wells to remove the groundwater necessary to maintain desired water levels. The extracted groundwater would be treated using air strippers or carbon adsorption to remove VOC's prior to discharge of the extracted groundwater to Stevens Creek.

Maintain Inward and Upward Gradients:

This alternative involves pumping limited quantities of groundwater from the saturated portions of the aquifers within the slurry walls. This process will maintain a hydraulic gradient inward across the slurry walls and upward, thereby restricting the movement of chemicals outward into the shallow aquifer zone (Zone 3). The use of hydraulic control in conjunction with the slurry walls ensures that contaminates will be kept localized (within the confines of each slurry wall) and add an additional level of protection if a slurry wall failure was to occur. The conjunctive use of slurry walls and hydraulic control is referred to as a slurry wall system. The extracted groundwater would be treated using air stripping or carbon-adsorption prior to discharge to Stevens Creek.

Flushing:

This alternative, for remediation of unsaturated aquifers within the slurry walls (Zone 2A), involves the extraction of water from the saturated soils, re-saturation of the unsaturated soils, treatment of extracted groundwater by air stripping, and reinjection of the treated water into resaturated soils within the slurry walls. The unsaturated soils would be remediated by flushing using a network of water injection and extraction wells. Extracted groundwater would be treated by air stripping prior to reinjection through the injection well network.

Partial Excavation and Ambient Temperature Aeration:

This alternative for 2A soils involves the partial excavation of highly localized areas of chemicals containing unsaturated disconnected aquifer soils. Treatment by ambient temperature aeration would be conducted inside a controlled atmosphere enclosure where necessary. This enclosure would prevent the migration of fugitive dust and chemicals vapors from the treatment area. Chemical vapors would be captured by activated carbon, if necessary.

Zone 2B - Saturated Disconnected Aquifers (Slurry Wall System)

No Further Action:

The No Action alternative involves no further treatment of the contained soils or hydraulic gradient control within the area bounded by the slurry walls. Long-term monitoring of water levels and chemical concentrations in the saturated disconnected aquifers (Zone 2B) and the shallow aquifer (Zone 3) water-bearing zones outside (beneath and around) the slurry walls would be required to detect migration of chemicals from the unsaturated soils within the slurry walls.

In-Situ Vapor Extraction With Dewatering:

This alternative for remediation of saturated aquifer soils involves dewatering the aquifers within the area bounded by the slurry walls, aerating the dewatered soil pore spaces by vacuum extraction, treating the extracted air, if required, with vapor-phase carbon adsorption, treating the extracted groundwater with air stripping, and discharging the treated air and water in accordance with applicable air and water quality requirements. The extracted groundwater would be treated using air strippers or carbon adsorption to remove VOCs prior to discharge of the extracted groundwater to Stevens Creek.

Maintain Inward and Upward Hydraulic Gradients:

This hydraulic control alternative for saturated aquifers within the slurry walls (Zone 2B), involves pumping relatively small quantities of water from within the slurry wall areas for the purpose of lowering the interior water table to produce inward and upward hydraulic gradients. The inward and upward hydraulic gradients would preclude the outward migration of chemicals present with the zone contained by the slurry wall areas. The small quantities of groundwater pumped from within the slurry walls would be treated using on-site air stripper-based systems or carbon adsorption, which would be operated in accordance with applicable air and water quality requirements. The required monitoring for this alternative would be the same scope as that required under the "No Further Action" (monitoring only) alternative.

Flushing:

This alternative for remediation of saturated aquifers within the slurry wall areas involves the extraction of water from the saturated soils, treatment of extracted groundwater by air stripping, and reinjection of the treated water into saturated soils within the slurry walls. Extracted groundwater would be treated using air strippers or carbon adsorption prior to reinjection through the injection well network.

10.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Under Section 121(d) of CERCLA, as amended by SARA, the selected remedy must achieve a level or standard of cleanup that assures protection of human health and the environment. In addition, CERCLA requires that remedial actions achieve a level or standard of cleanup that meets legally applicable or relevant and appropriate requirements, standards, criteria or limitations (ARARs).

ARARs associated with the site have been generally separated into three categories: (1) ambient or chemical specific requirements that set health or risk-based concentration limits or ranges for particular chemicals; (2) performance, design, or action-specific requirements that govern particular activities; and (3) location-specific requirements. For this site the selection of ARARs is dependant on the defined beneficial use of groundwater as a source of drinking water.

Beneficial Use of Local Groundwater as a Source of Drinking Water

The regulatory framework associated with the cleanup of groundwater and soil at the site is driven by the beneficial (current or potential) use of local groundwater. As stated in 40 CFR 300 of the Federal Register on page 51433 (December 21, 1988), "The goal of EPA's Superfund approach is to return usable ground waters to their beneficial uses within a timeframe that is reasonable". Drinking water is considered to be the highest beneficial use and affords the greatest level of protection and cleanup.

As required by the California Portor-Cologne Water Quality Control Act, the Regional Water Quality Control Board - San Francisco Bay Region defines the beneficial uses of various water bodies in the greater San Francisco Bay Area. Water bodies and their beneficial uses are presented in The San Francisco Basin Plan. This regional plan has been promulgated and is an ARAR for this site. In the Basin Plan the Regional Board classifies the shallow aquifers in the area of the MEW plume as a "potentially suitable for municipal or domestic water supply". In addition, the Basin Plan states that the "use of waters in the vicinity represent the best information on beneficial uses". Currently, the C and Deep aquifers at the site are used as a municipal drinking water supply.

CHEMICAL-SPECIFIC ARARS

Chemical-specific ARARs for the MEW site are Federal and State of California drinking water standards. Each is relevant and appropriate to set cleanup standards at the site. A list of Federal and State drinking water standards are presented in Table 10-1.

Federal Drinking Water Standards

Potential drinking water standards at the site include Maximum Contaminant Level Goals (MCLGs) and Maximum Contaminant Levels (MCLs):

As stated in CERCLA Section 121 (d)(1), MCLGs are mentioned as potential cleanup standards when these levels "are relevant and appropriate under the circumstances". After weighing all factors, EPA has determined that they are not relevant and appropriate for the site.

The relevant and appropriate standards to establish groundwater cleanup levels at the site are the Federal Maximum Contaminant Levels (MCLs), as presented under Safe Drinking Water Act. EPA bases this decision on the fact that MCLs are fully protective of human health and, for carcinogens, fall within the established acceptable risk range of 10^{-4} to 10^{-7}. MCLs are ARARs for groundwater at the site and are also used to establish soil cleanup levels.

State Drinking Water Standards

California Drinking Water Standards establish enforceable limits for substances that may affect health or aesthetic qualities of water and apply to water delivered to customers. The state's Primary Standards are based on federal National Interim Primary Drinking Water Regulations. Currently, California has promulgated MCLs for cadmium, arsenic and lead, and some of the organics of concern.

ACTION SPECIFIC ARARs

Groundwater extraction and treatment involves pumping, treating, and discharging the treated groundwater and/or reinjecting it into the aquifer. Soil remediation can include excavation and/or in-situ treatment. With groundwater treatment and in-situ vapor extraction, Volatile Organic Chemicals (VOCs) would be removed by air stripping and/or Granular Activated Carbon (GAC) adsorption. Air stripping requires consideration of ARARs for VOC emissions, GAC use requires consideration of ARARs associated with carbon regeneration or disposal, and discharge or reinjection must meet specific ARARs.

Discharge to Surface Water

Substantive National Pollutant Discharge Elimination System (NPDES) permit requirements would apply to treated effluent discharging to surface waters. These would primarily be effluent limitations and monitoring requirements. The RWQCB regulates NPDES discharges. Ambient Water Quality Criteria are used by the State of California to set Water Quality Standards in the San Francisco Bay Regional Basin Plan. Standards in the Basin Plan are used by the RWQCB to set NPDES effluent discharge limitations.

Section 402 of the Clean Water Act, as amended in 1987, will result in the prohibition of discharge of non-storm waters to the City of Mountain View storm sewer system by 1991.

Reinjection of Treated Effluent Into Aquifers

If treated groundwater is reinjected, regulations governing underground injection may apply. Specifically, the Federal Safe Drinking Water Act requires an Underground Injection Control (UIC) program. In California, the UIC program is administered by U.S. EPA. The UIC program prohibits treated effluent from being injected, into or above a source of drinking water. Except when it is pursuant to a CERCLA cleanup UIC regulations do not regulate the concentration of constituents, rather they regulate only the method and location of the injection. These Federal requirements regarding injection may be "relevant and appropriate" to the site.

Federal RCRA requirements and the State's Toxic Injection Well Control Act of 1985 (Cal. Health & Safety Code Section 25159.10 et seq.) might also be "relevant and appropriate" to the reinjection of treated groundwater.

TABLE 10-1

FEDERAL AND STATE GROUNDWATER STANDARDS
MIDDLEFIELD/ELLIS/WHISMAN STUDY AREA

Chemical	Federal Maximum Contaminant Levels (MCLs) (mg/liter)	State MCLs (mg/liter)
<u>Organics</u>		
Chloroform	0.100	-
1,2-Dichlorobenzene	-	-
1,1-Dichloroethane	-	-
1,1-Dichloroethene	0.007	0.006
1,2-Dichloroethene	-	-
Freon-113	-	-
Phenol	-	-
Tetrachloroethene	-	-
1,1,1-Trichloroethane	0.200	0.200
Trichloroethene	0.005	0.005
Vinyl Chloride	0.002	0.0005
<u>Inorganics</u>		
Antimony	-	-
Cadmium	0.010	0.010
Arsenic	0.050	0.050
Lead	0.050	0.050

Discharge to Sanitary Sewers

Discharge of treated groundwater to the local sanitary sewer system requires compliance with the City's of Mountain View's Industrial Waste Ordinance and the Clean Water Act Pretreatment Standards. The City's Ordinance sets forth effluent quantity and discharge concentration limits, along with standards for monitoring and reporting. Substantive requirements are "legally applicable" for on-site discharges of the treated water. The Clean Water Act allows municipalities to determine pretreatment standards for discharges to Publicly Owned Treatment Works (POTWs), within its jurisdiction.

Air Stripping - Air Emission Standards

Any new source that emits toxic chemicals to the atmosphere at levels determined by the San Francisco Bay Area Air Quality Management District (BAAQMD) "to be appropriate for review" must have authorization to construct and operate. Although on-site treatment facilities are exempted by CERCLA from the administrative requirements of the permit, emission limits and monitoring requirements imposed by the BAAQMD permit must be met.

Carbon Adsorption

Use of granular activated carbon (GAC) for remediation of VOCs can trigger requirements associated with regeneration or disposal of the spent carbon. If the spent carbon is a listed waste or a characteristic waste then it is regulated as a hazardous waste under RCRA and California's hazardous waste control laws. Disposal of contaminants can trigger RCRA land disposal restrictions. For disposal, the spent carbon would need to be treated to meet Best Demonstrated Available Technology (BDAT) treatment standards, and RCRA off-site Subtitle C disposal restrictions would also apply.

Regeneration of activated carbon, using a high-temperature thermal process, is considered "recycling" under both Federal and California hazardous waste regulations. Transportation, storage, and generation of hazardous waste for recycling must comply with requirements in RCRA and California hazardous waste control regulations. Performance standards for hazardous waste incinerators can also be requirements for on-site carbon reactivation. On-site storage of contaminated carbon may trigger substantive requirements under municipal or county hazardous materials ordinances. If the spent carbon is a hazardous waste, construction and monitoring requirements for storage facilities may also apply.

Excavation, Above-Ground Treatment and Disposal of Soil

Excavated contaminated soils will require on-site treatment or disposal off-site. On-site treatment by above-ground soil aeration, will need to comply with the substantive provisions of the BAAQMD and possibly RCRA land disposal restrictions. Excavated soil classified as a hazardous waste can also trigger RCRA, state and local requirements. EPA land disposal restrictions may be applicable for off-site disposal. RCRA Subtitle C may apply to disposal of soils on-site.

For the on-site treatment of soils, the BAAQMD regulates aeration of soil containing over 50 ppb of organics. The BAAQMD sets rates at which soil can be aerated depending upon the level of chemicals. BAAQMD Regulation 8, Rule 40 on the treatment of soil, assuming it is a hazardous waste, may also trigger RCRA land disposal restrictions and BDAT treatment requirements.

LOCATION SPECIFIC ARARs

Fault Zone

The MEW sites are not located within 61 meters (200 feet) of a fault. Therefore, the fault zone requirement of 40 CFR Part 264 is satisfied.

Floodplain

A hazardous waste treatment facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood. The MEW site is not located in a floodplain, therefore these requirements are neither applicable or relevant and appropriate.

11.0 OTHER CRITERIA CONSIDERED

In establishing selected remedial alternatives, EPA considers various procedures, criteria and resolutions. These "to be considered" criteria (TBCs) do not raise to the level of ARARs, but are relevant to the cleanup of the site. The following discussion presents selected criteria relevant to the selection of remedial alternatives.

Criteria Establishing Local Groundwater as a Source of Drinking Water

Various criteria were used to establish that the shallow, C, and Deep aquifers are a source of drinking water. EPA's groundwater classification system was used. Using the "EPA Guidelines for Ground-Water Classification" as a guide, EPA determined that the A- and B-aquifers in the MEW area are classified as "potential drinking water sources". Currently, the C-aquifer and Deep aquifers are used for drinking water and therefore would be classified as a current drinking water source. As stated in the ARARs section, the Regional Water Quality Control Board classified the shallow groundwater as "potentially suitable for municipal or domestic water supply". The RWQCB determined that this classification is consistent with the State Water Resource Control Board's Resolution No. 88-63, which describes criteria for designating sources of drinking water.

State Criteria for Groundwater Cleanup

California has criteria for evaluating drinking water quality and groundwater cleanup: advisory Drinking Water Action Levels, and advisory Applied Action Levels.

Drinking Water Action Levels are health-based concentration limits set by DHS to limit public exposure to substances not yet regulated by promulgated standards. They are advisory standards that would apply at the tap for public water supplies, and do not rise to the level of ARARs. Nonetheless, they have been considered in developing cleanup standards for the MEW site.

Applied Action Levels (AALs) were developed by DHS for use with the California Site Mitigation Decision Tree. AALs are guidelines that DHS uses to evaluate the risk a site poses to certain biologic receptors. They are neither enforceable, nor ARARs, but have been considered in developing cleanup standards for the MEW site.

Groundwater criteria, to be considered for determining cleanup levels, are presented in Table 11-1.

California Resolution 68-16

Resolution 68-16 is California's "Statement of Policy With Respect to Maintaining High Quality of Waters in California". EPA regards Resolution 68-16 as criteria to establish groundwater cleanup levels. The policy requires maintenance of existing water quality unless it is demonstrated that a change will benefit the people of the state, will not unreasonably affect beneficial uses of the water, and will not result in water quality less than prescribed by other state policies.

TABLE 11-1

GROUNDWATER CRITERIA TO BE CONSIDERED
MIDDLEFIELD/ELLIS/WHISMAN STUDY AREA

Chemical	State Drinking Water Action Levels (mg/liter)	State Applied Action Levels[a] (mg/liter)
<u>Organics</u>		
Chloroform	0.020	0.006
1,2-Dichlorobenzene	0.130	-
1,1-Dichloroethane	0.020	-
1,1-Dichloroethene	-	-
1,2-Dichloroethene	0.016	-
Freon-113	18.000	-
Phenol	-	-
Tetrachloroethene	0.004	-
1,1,1-Trichloroethane	-	-
Trichloroethene	-	-
Vinyl Chloride	-	-
<u>Inorganics</u>		
Antimony	-	-
Cadmium	-	-
Arsenic	-	-
Lead	-	-

a/ Applied Action Level for water for human receptors.

A beneficial use of the groundwater in the shallow and deep aquifer system is drinking water. Establishing a cleanup level which maintains this beneficial use should attain the requirements of Resolution 68-16.

Remediation Levels for Soils

A standard for the remediation of contaminated soils was reached during the Feasibility Study by using a simple percolation-transport model with the concepts presented in California's Site Mitigation Decision Tree. The model was used to determine concentrations in soil based upon transport downward into groundwater. Based upon the analysis from the model, a soil remediation goal of 100 times the groundwater remediation level is appropriate to set cleanup standards in soil.

Health Advisories

EPA considers that for a remedial action of a drinking water source to be protective, it should have a cumulative risk that falls within a range of 10^{-4} to 10^{-7} individual lifetime excess cancer risk. To evaluate the risk to public health posed by recommended cleanup goals, health advisories were used to establish cumulative risk. Lifetime average daily doses (LADD) were calculated by multiplying a concentration by 2 liters per day and dividing by 70 kilograms. Cancer risk for a constituent of a given concentration was determined by multiplying the LADD by its Cancer Potency Factor (CPF). Ratios of contaminants in aquifers of the site were then calculated in relation to TCE. A summation of risk for carcinogens in each aquifer were calculated for a given concentration of TCE. For a 5 ppb (MCL) cleanup goal for TCE in the A-, B1-, and B2- aquifers the cumulative estimated carcinogenic risk falls within a range of $1.3(10)^{-5}$ to $7.4(10)^{-5}$. In the C- and Deep aquifers the cleanup goal of 0.8 ppb corresponds to a cumulative estimated carcinogenic risk of $1.0(10)^{-6}$. Supporting calculations are presented in the Feasibility Study.

Cleanup goals in the shallow aquifers, above the B/C aquitard, are set at 5 ppb for TCE. Cleanup goals in the C and Deep aquifers, below the B/C aquitard, are set at 0.8 ppb for TCE. Assuming the ratios of carcinogen remain relatively constant, attainment of these goals will result in achieving EPA's acceptable risk range of 10^{-4} to 10^{-7} upon completion of the remedial action.

Air Stripping Control Policies

Any existing and new source(s) that emit toxic chemicals will have to comply with any EPA, BAAQMD, or Air Resources Board policies on control of air emissions from air-strippers.

12.0 SUMMARY OF ALTERNATIVES ANALYSIS

This section presents an analyses of the alternatives, evaluated in the detailed analysis of remedial alternatives, with respect EPA's evaluation criteria. Design elements of the alternatives are presented in Section 9.0. Table 12-1 provides a summary of the advantages and disadvantages of each alternative's performance and cost.

State and community acceptance are discussed below:

State Acceptance

The State (of California) generally supports EPA's proposed cleanup plan. The state commented, however, that the cleanup goals for soils and groundwater inside the boundary of the existing slurry walls should be 0.5 ppm TCE for soil and 5 ppb TCE for the groundwater; the same goals as for outside of the slurry walls.

In the Responsiveness Summary, EPA stated that the slurry walls in conjunction with pumping and monitoring will be protective of the public health and the environment, with the 1 ppm TCE cleanup goal for soils bounded by the slurry walls. This monitoring and pumping strategy will limit the amount of contamination that can leach into the shallow aquifers, outside of the slurry walls. EPA did respond to the State's request of a 5 ppb TCE cleanup goal for all shallow aquifers, by establishing the 5 ppb TCE cleanup goal for the aquifers inside of the slurry walls.

Community Acceptance

The community agrees with EPA's proposed remedial alternatives, although there is concern with the length of time estimated to achieve the shallow aquifer cleanup goals. The use of the "hazard index" was urged to establish cleanup goals instead of MCLs. EPA explained in the Responsiveness Summary that the hazard index was not applicable to the MEW area.

In addition, reuse of the extracted groundwater was recommended by the community. As stated in the Responsiveness Summary, reuse of extracted groundwater will be evaluated and is a component of the ROD.

The Responsiveness Summary (attached) addresses these concerns and others in more detail.

Table 12-1

Criteria for the Evaluation of Remedial Alternatives

(continued)

ALTERNATIVE	SHORT-TERM EFFECTIVENESS	LONG-TERM EFFECTIVENESS AND PERMANENCE	REDUCES TOXICITY, MOBILITY, VOLUME	IMPLEMENTABILITY	COMPLIANCE WITH ARARs	LONG-TERM PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	ADDT'L CAPITAL COSTS (000'S)	ANNUAL O & M COSTS (000'S)	PRESENT WORTH (rounded, 000's)
ZONE 2B									
NO FURTHER ACTION	NO EFFECT IN SHORT-TERM	ALLOWS CONT'D MIGRATION	NO ACTIVE REDUCTION IN TOXICITY, MOBILITY OR VOLUME	NO TECHNICAL LIMITATIONS	DOES NOT MEET ALL ARARs	PROTECTION PROVIDED BY MONITORING ONLY	17	160	1,600
IN-SITU SOIL AERATION (WITH CARBON ADSORPTION AND REGENERATION)	EFFECTIVE IN SHORT-TERM	PERMANENT SOLUTION	REDUCES TOXICITY, MOBILITY AND VOLUME	NO TECHNICAL LIMITATIONS	COMPLIES WITH ARARs	PROVIDES PROTECTION	1,061 TO 2,097	1,679 TO 1,763	6,100 TO 9,000
MAINTAIN INWARD AND UPWARD HYDRAULIC GRADIENTS (WITH TREATMENT OF EXTRACTED WATER)	EFFECTIVE IN SHORT-TERM	PERMANENT SOLUTION BUT REQUIRES CONTINUED PUMPING	REDUCES TOXICITY, MOBILITY AND VOLUME	NO TECHNICAL LIMITATIONS	COMPLIES WITH ARARs	PROVIDES PROTECTION; NEEDS INSTITUTIONAL CONTROL	0	595	6,000
FLUSHING (WITH TREATMENT OF EXTRACTED WATER)	NOT EFFECTIVE IN SHORT-TERM	PERMANENT SOLUTION IF NO CHEMICAL MIGRATION	REDUCES TOXICITY, MOBILITY AND VOLUME IF NO CHEMICAL MIGRATION	NOT FEASIBLE DUE TO COMPLEX SITE STRATIGRAPHY	COMPLIES WITH ARARs	PROTECTION LIMITED BY CHEMICAL MIGRATION	1,033	1,459	13,000

Table 12-1

Criteria for the Evaluation of Remedial Alternatives

(continued)

ALTERNATIVE	SHORT-TERM EFFECTIVENESS	LONG-TERM EFFECTIVENESS AND PERMANENCE	REDUCES TOXICITY, MOBILITY, VOLUME	IMPLEMENTABILITY	COMPLIANCE WITH ARARs	LONG-TERM PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	ADDT'L CAPITAL COSTS (000'S)	ANNUAL O & M COSTS (000'S)	PRESENT WORTH (rounded, 000's)
ZONE 2A									
NO FURTHER ACTION	NO EFFECT IN SHORT-TERM	ALLOWS CONTINUED MIGRATION	NO ACTIVE REDUCTION IN TOXICITY, MOBILITY OR VOLUME.	NO TECHNICAL LIMITATIONS	DOES NOT MEET ALL ARARs	PROTECTION PROVIDED BY MONITORING ONLY	N/A	N/A	N/A
IN-SITU SOIL AERATION (WITH CARBON ADSORPTION AND REGENERATION)	EFFECTIVE IN SHORT-TERM	PERMANENT SOLUTION	REDUCES TOXICITY, MOBILITY AND VOLUME	NO TECHNICAL LIMITATIONS	COMPLIES WITH ARARs	PROVIDES PROTECTION	207	638	1,000
MAINTAIN INWARD AND UPWARD HYDRAULIC GRADIENTS (WITH TREATMENT OF EXTRACTED WATER)	EFFECTIVE IN SHORT-TERM	PERMANENT SOLUTION BUT REQUIRES CONTINUED PUMPING	REDUCES TOXICITY, MOBILITY AND VOLUME	NO TECHNICAL LIMITATIONS	COMPLIES WITH ARARs	PROVIDES PROTECTION; NEEDS INSTITUTIONAL CONTROLS	0	405	4,100
FLUSHING (WITH TREATMENT OF EXTRACTED WATER)	NOT EFFECTIVE IN SHORT-TERM	PERMANENT SOLUTION IF NO CHEMICAL MIGRATION	REDUCES TOXICITY, MOBILITY AND VOLUME IF NO CHEMICAL MIGRATION	NOT FEASIBLE DUE TO COMPLEX SITE STRATIGRAPHY	COMPLIES WITH ARARs	PROTECTION LIMITED BY CHEMICAL MIGRATION	804	867	7,500
PARTIAL EXCAVATION WITH AMBIENT TEMPERATURE AERATION (WITH CARBON ADSORPTION AND REGENERATION)	EFFECTIVE, BUT POTENTIAL FOR INCREASED EXPOSURE DURING EXCAVATION	PERMANENT SOLUTION	REDUCES TOXICITY, MOBILITY AND VOLUME	DIFFICULT TO CONTROL AIR EMISSIONS	COMPLIES WITH ARARs	PROVIDES PROTECTION	869	0	900

Table 12-1

Criteria for the Evaluation of Remedial Alternatives

(continued)

ALTERNATIVE	SHORT-TERM EFFECTIVENESS	LONG-TERM EFFECTIVENESS AND PERMANENCE	REDUCES TOXICITY, MOBILITY, VOLUME	IMPLEMENTABILITY	COMPLIANCE WITH ARARs	LONG-TERM PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	ADDT'L CAPITAL COSTS (000'S)	ANNUAL O & M COSTS (000'S)	PRESENT WORTH (rounded, 000's)
ZONE 3									
NO FURTHER ACTION	NO EFFECT IN SHORT TERM	ALLOWS CONTINUED MIGRATION	NO ACTIVE REDUCTION IN TOXICITY, MOBILITY OR VOLUME	NO TECHNICAL LIMITATIONS	DOES NOT MEET ALL ARARs	PROTECTION PROVIDED BY MONITORING ONLY	310	685	7,200
HYDRAULIC CONTROL BY GROUND WATER EXTRACTION AND TREATMENT	EFFECTIVE IN SHORT-TERM	PERMANENT SOLUTION BUT REQUIRES CONTINUED PUMPING	REDUCES TOXICITY, MOBILITY AND VOLUME	NO TECHNICAL LIMITATIONS	COMPLIES WITH ARARs	PARTIAL PROTECTION; NEEDS INSTITUTIONAL CONTROLS	2,703	1,670	19,500
HYDRAULIC REMEDIATION BY GROUND WATER EXTRACTION AND TREATMENT	EFFECTIVE IN SHORT-TERM	PERMANENT SOLUTION	REDUCES TOXICITY, MOBILITY AND VOLUME	NO TECHNICAL LIMITATIONS	COMPLIES WITH ARARs	PROVIDES PROTECTION	5,567	2,903	27,000 TO 31,000
VERTICAL IMPERMEABLE BARRIERS	EFFECTIVE, BUT POTENTIAL FOR EXPOSURE DURING CONSTRUCTION	NOT A PERMANENT SOLUTION	DOES NOT MEET CRITERIA[1]	INFEASIBLE DUE TO TECHNICAL LIMITATIONS	DOES NOT MEET ALL ARARs	PARTIAL PROTECTION; NEEDS INSTITUTIONAL CONTROLS	35,410	0	35,400

[1] Note: Section 121(b) of CERCLA states a preference for treatment which permanently and significantly reduces the volume, toxicity or mobility of the contaminants. The use of vertical impermeable barriers (i.e., slurry walls) by themselves is containment and source control, and does not constitute treatment. Only with the addition of groundwater extraction and treatment does this alternative meet statutory criteria. While this evaluation differs somewhat from the evaluation found in the FS, it does not affect EPA's remedy selection.

Table 12-1

Criteria for the Evaluation of Remedial Alternatives
(continued)

ALTERNATIVE	SHORT-TERM EFFECTIVENESS	LONG-TERM EFFECTIVENESS AND PERMANENCE	REDUCES TOXICITY, MOBILITY, VOLUME	IMPLEMENTABILITY	COMPLIANCE WITH ARARs	LONG-TERM PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	ADDI'L CAPITAL COSTS (000'S)	ANNUAL O & M COSTS (000'S)	PRESENT WORTH (rounded, 000's)
ZONE 4									
NO FURTHER ACTION	NO EFFECT IN SHORT-TERM	ALLOWS CONTINUED MIGRATION	NO ACTIVE REDUCTION IN TOXICITY, MOBILITY OR VOLUME	NO TECHNICAL LIMITATIONS	DOES NOT MEET ALL ARARs	PROTECTION PROVIDED BY MONITORING ONLY	82	187	2,000
HYDRAULIC REMEDIATION BY GROUND WATER EXTRACTION AND TREATMENT	EFFECTIVE IN SHORT-TERM	PERMANENT SOLUTION	REDUCES TOXICITY, MOBILITY AND VOLUME	NO TECHNICAL LIMITATIONS	COMPLIES WITH ARARs	PROVIDES PROTECTION	739	449	1,100 TO 4,200

(1) N/A - NOT APPLICABLE

13.0 THE SELECTED REMEDIES

The selected remedies for soils are: 1) in-situ vapor extraction with treatment by vapor phase granular activated carbon (GAC), and 2) excavation and treatment by aeration to meet federal, state, and local air standards. Most of the vapor extraction will be performed on soils inside of the existing Fairchild and Raytheon slurry walls, where the highest concentrations of soil contamination are found. The vapor extraction is estimated to be in operation from 1 to 6 years. The excavation and treatment of contaminated soils may invoke RCRA Landban requirements which would also require treatment to meet BDAT standards. Intel has previously excavated and aerated their contaminated soil under RWQCB orders. These selected remedial alternatives will likely be used at other potential sources in the MEW area. EPA expects soil remediation to be implemented by the PRPs.

The soil cleanup goals for the MEW area are: 0.5 parts per million (ppm) TCE for all soils outside of the slurry walls and 1 ppm TCE for soils inside the slurry walls. The cleanup goal for soils outside of the slurry walls is based upon the amount of contamination that can remain in the soil, leach into the groundwater and still achieve the cleanup goal for the shallow aquifers. The rationale for the use of a higher cleanup goal for soils bounded by the slurry walls is presented in the following discussion. Although the aquifers bounded by the slurry walls are considered potential drinking water sources, this groundwater is effectively isolated when local hydraulic control is implemented by pumping inside the confines of the slurry walls. This isolation of contaminated groundwater and soil bounded by the slurry walls provides an additional level of protection of the significantly larger drinking water source outside of the slurry walls. This additional level of protection through the use of a slurry wall system (slurry wall and hydraulic control) allows for a higher soil cleanup goal for soils confined by the slurry walls. But, the use of the 1 ppm TCE cleanup level for these soils is dependent upon the continued operation of a pumping system which maintains local hydraulic control of groundwater inside the slurry walls. If local hydraulic control by pumping was to cease, then the lower soil cleanup goal of 0.5 ppm TCE would need to be attained. In summary, the soil cleanup goal is higher inside of the slurry walls because of the extra degree of protectiveness provided by the slurry walls in conjunction with the maintenance of inward and upward gradients into the area confined by the slurry walls, with a system of hydraulic control by pumping of groundwater. To ensure that the slurry wall system is effectively working, regular monitoring will be performed of local groundwater quality and water elevations. During the

Table 12-1

Criteria for the Evaluation of Remedial Alternatives

ALTERNATIVE	SHORT-TERM EFFECTIVENESS	LONG-TERM EFFECTIVENESS AND PERMANENCE	REDUCES TOXICITY, MOBILITY, VOLUME	IMPLEMENTABILITY	COMPLIANCE WITH ARARs	LONG-TERM PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	ADDT'L CAPITAL COSTS (000'S)	ANNUAL O & M COST (000'S)	PRESENT WORTH (rounded, 000's)
Zone I									
NO FURTHER ACTION	NO EFFECT IN SHORT-TERM	ALLOWS CONTINUED MIGRATION	NO ACTIVE REDUCTION IN TOXICITY, MOBILITY OR VOLUME	NO TECHNICAL LIMITATIONS	DOES NOT MEET ALL ARARs	PROTECTION PROVIDED BY MONITORING ONLY	N/A[1]	N/A	N/A
IN-SITU SOIL AERATION (WITH CARBON ADSORPTION AND REGENERATION)	EFFECTIVE IN SHORT-TERM	PERMANENT SOLUTION	REDUCES TOXICITY, MOBILITY AND VOLUME	NO TECHNICAL LIMITATIONS	COMPLIES WITH ARARs	PROVIDES PROTECTION	1,107 TO 1,253	812 TO 863	1,800 TO 5,000
PARTIAL EXCAVATION WITH AMBIENT TEMPERATURE AERATION (WITH CARBON ADSORPTION AND REGENERATION)	EFFECTIVE, BUT POTENTIAL FOR INCREASED EXPOSURE DURING EXCAVATION	PERMANENT BUT NOT A COMPLETE SOLUTION	REDUCES TOXICITY, MOBILITY AND VOLUME	DIFFICULT TO CONTROL AIR EMISSIONS AND ALL IMPACTED SOILS NOT REMEDIATED	DOES NOT MEET ARARs FOR UNEXCAVATED SOILS	CHEMICALS LEFT IN SOILS COULD MIGRATE TO SHALLOW AQUIFERS	6,673	--	6,700
PARTIAL EXCAVATION WITH AMBIENT TEMPERATURE AERATION AND IN-SITU SOIL AERATION (WITH CARBON ADSORPTION AND REGENERATION)	EFFECTIVE, BUT POTENTIAL FOR INCREASES EXPOSURE DURING EXCAVATION	PERMANENT SOLUTION	REDUCES TOXICITY, MOBILITY AND VOLUME	DIFFICULT TO CONTROL AIR EMISSIONS	COMPLIES WITH ARARs	PROVIDES PROTECTION	7,225 TO 7,357	270 TO 282	7,500 TO 8,600

duration of the remedy, there will be an evaluation of the remedy and cleanup goals at least every five years.

The selected groundwater remedy is hydraulic remediation by groundwater extraction and treatment. The groundwater cleanup goals by pumping and treatment are: 5 ppb TCE for the shallow aquifers (including the aquifers inside the slurry walls) and 0.8 ppb TCE for the C and Deep aquifers. The cleanup goal is more stringent for the C and Deep aquifers, because they are currently used as a supply for municipal drinking water and will be technically easier to remediate than the shallow aquifers. The 0.8 ppb cleanup goal corresponds to a 10^{-6} cumulative (human) cancer risk.

Although the shallow aquifers are not currently used for drinking water, they are a potential source for drinking water and therefore a 5 ppb TCE cleanup goal has been established which corresponds to between a 10^{-6} and 10^{-5} excess cancer risk, which is within EPA's acceptable risk range. Cancer risks have been screened for all aquifers and the chemical ratio of TCE to other chemicals found at the site is such that achieving the cleanup goal for TCE will result in cleanup of the other site chemicals to at least their respective MCLs.

The estimated time to reach the deep aquifer cleanup goal is between 2 to 45 years. The time to reach the shallow aquifer cleanup goal may be considerably longer, possibly from 46 years or into the indefinite future, because of the physical and chemical nature of the shallow aquifers. They are low yielding and contain soils with a high clay content which attract and retain the site chemicals. During the duration of the remedial effort, both shallow and deep aquifers will be regularly monitored for water quality and groundwater elevations.

The extracted groundwater will be treated largely by air strippers, although some companies (e.g., Intel) may use their existing liquid phase GAC units. The three currently operating air strippers have been permitted by the Bay Area Air Quality Management District and are not using emissions controls. The air stripper stacks have been designed to meet risk levels of $<10^{-6}$ excess cancers. We anticipate that with the additional air strippers to be installed and the increased flow rates during full scale remediation, emissions controls will likely be needed to meet more stringent air district standards. The emissions controls will consist of GAC vapor phase carbon units.

The extracted groundwater will be reused to the maximum extent feasible, with 100% reuse as a goal. The remaining extracted groundwater will be discharged under NPDES requirements to Stevens Creek. Work has already commenced on various water reuse options, which will be presented and implemented during the RD/RA phase.

The remedy also includes the identification and sealing of any conduits or potential conduits, using the decision process outlined in the FS. Several identified abandoned agriculture wells have allowed contamination to migrate from the shallow aquifers to the deep aquifers. These wells have subsequently been sealed. Additional wells have been identified for sealing and other wells may also be identified during RD/RA phase which will require sealing.

To evaluate the effectiveness of remedial actions and to determine when cleanup goals are attained, regular monitoring of chemical concentrations and water elevations is required at selected wells across the site. For soil cleanup, EPA will need to concur on a method to determine when the required cleanup goals have been achieved.

The estimated costs of the selected remedies are provided in Table 12-1 and include the use of emissions controls, well sealing, and monitoring. The total cost of the remedies, in present worth dollars, is estimated to be between $49M to $56M.

14.0 STATUTORY DETERMINATIONS

The selected remedies are protective of human health and the environment -- as required by Section 121 of CERCLA -- in that contamination in groundwater is treated to at least MCLs and falls within EPA's acceptable risk range of 10^{-4} to 10^{-7}. In addition, the remedy at least attains the requirements of all ARARs, including Federal and State MCLs.

Furthermore, as shown on Table 12-1, the groundwater remedy - pumping, and treating with air strippers and the soil remedy - vapor extraction, are cost effective technologies. Soil excavation with aeration has also been shown to be cost effective when it was used at the Intel facility, and may also be used at other facilities.

The selected remedies will permanently and significantly reduce the toxicity, mobility, and volume of hazardous substances with respect to their presence in soils and groundwater. The use of vapor extraction for soils is an innovative treatment technology for removing VOCs.

Contamination is controlled and removed from the groundwater, thereby reducing the potential threat to the nearby public water supply wells and also restoring the aquifers to meet drinking water standards. The slurry walls in conjunction with pumping and treatment reduces toxicity, volume and mobility of contamination to migrate from major source areas. The sealing of conduit wells will reduce the likelihood of vertical migration of contamination.

Emissions from soil vapor extraction will be controlled by vapor phase GAC. Emissions from air stripping towers will meet local air district requirements, which are anticipated to be a 10^{-6} risk level, and therefore will likely require vapor phase GAC. The regeneration of spent carbon from the GAC emission controls will meet all Federal, State, and local requirements.

-- ATTACHMENTS --

RESPONSIVENESS SUMMARY FOR THE FAIRCHILD, INTEL, AND RAYTHEON SITES
MIDDLEFIELD-ELLIS-WHISMAN (M-E-W) STUDY AREA
Mountain View, California

I. COMMUNITY RELATIONS HISTORY

EPA has carried on an active community relations program at the Middlefield-Ellis-Whisman (MEW) Study Area.

In early 1986, EPA, in conjunction with Santa Clara County, initiated monthly meetings for all agencies involved in hazardous waste investigation and cleanup to review and coordinate activities. Representatives of local, state and federal agencies, elected officials, business and industry and public interest groups attend the meetings. The meetings continue on a quarterly basis.

In the spring of 1986, new contamination was found in Mountain View's deep aquifer This discovery marked the first time contamination had been detected at those depths in that part of Santa Clara County. In response to community concerns and questions about the safety of the drinking water supply, EPA prepared a fact sheet describing the situation and distributed it to the site mailing list.

In May 1986, EPA worked with Fairchild Semiconductor Corp. to prepared a 4-page insert for Mountain View's The View to explain Fairchild's proposal to construct three slurry walls in order to confine their site's contaminated soils and to pump and treat water confined by the walls.

In February 1987, Raytheon and EPA worked together to prepare another insert for The View that described Raytheon's proposed slurry wall to contain contamination around their site.

In June 1987, EPA worked with Raytheon, Intel and Fairchild to produce an insert for The View describing the draft Remedial Investigation (RI) report.

In November 1988, EPA released a Feasibility Study (FS) on the Middlefield-Ellis-Whisman Study Are to the public. The report described and evaluated various clean-up alternatives based on data and support documents available at the time. EPA's preferred alternatives were: vapor extraction and treatment for soils, pumping and treating for shallow and deep aquifers; and vapor extraction, groundwater control and treatment for the slurry wall systems.

In fulfillment of community participation requirements, EPA held a public comment period from November 21, 1988, through January 23, 1989; briefings of local officials and community members; and a community meeting. EPA also prepared a Proposed Plan fact sheet which outlined the range of cleanup alternatives, cleanup goals, and EPA's preferred alternative for distribution to the site mailing list. Prior to the fact sheet, EPA also released a press advisory announcing the range of alternatives and EPA's preferred alternative.

RESPONSIVENESS SUMMARY

The community meeting was held December 14, 1988, to present clean-up alternatives, to answer questions and to take comments on the FS. Comments centered on the length of the cleanup period and on who would do the cleanup.

Written comments on EPA's Proposed Plan focussed on the following issues: cleanup levels for soil and groundwater, length of public comment period, variations in the text of the FS report, and length of cleanup time. Responses to public comments are addressed in the attached response summary. Most of the comments were submitted by Potentially Responsible Parties.

II. SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES

Technical Comments

1. Comment: Several comments concerned the number and location of recovery wells to be placed in the MEW area.

EPA Response: The Feasibility Study (FS) and Proposed Plan are not design documents. The exact number and location of recovery wells will be determined during the remedial design phase.

2. Comment: NASA-Ames Research Center had several concerns: 1. how the proposed treatment system would handle groundwater contaminated with fuel, 2. how other cleanup actions may be influenced by the proposed recovery wells, 3. the effects that the proposed hydraulic remediation may have on existing contamination at NASA-Ames and the adjacent Moffett Naval Air Station.

EPA Response: The above concerns will be addressed during the Remedial design and Remedial Action (RD/RA) phases. Obviously, a large degree of cooperation and coordination will be required by the affected parties during RD/RA, to ensure a successful remediation program.

3. Comment: "The FS proposes to remediate soils using in situ soil aeration. Air inlet wells may also be installed to increase the efficiency of the soil aeration system. It is suggested that if air inlet wells are to be installed they should be used to control the extent of an in situ negative soil air pressure field, not to increase soil air flow through the contaminated soils. If they are installed solely for the purpose of increasing airflow across the contaminated soil particles, their use is questionable."

EPA Response: VOC's have a marked tendency to partition into the soil atmosphere. The rate of desorption into pore space is principally a function of chemical diffusion in response to a concentration gradient. Sweeping of clean air through a soil matrix increases the concentration gradient and therefore increases partitioning and the overall efficiency of the in situ soil aeration system. The result of creating a negative air pressure field, with an in situ air stripping system, does have a minor effect on soil-air partitioning, but the field tends to be localized around the extraction well(s) and the overall effect is negligible. The key to an efficient in situ vapor extraction system is increasing the airflow across contaminated soil particles and not simply to control the negative soil air pressure field. The use of air inlet wells will be analyzed further during the RD/RA phases of this project.

Comments On EPA's Process

1. Comment: Several commenters who are Potentially Responsible Parties (PRPs) stated that the comment period was too short to adequately review the FS and Remedial Investigation (RI) report. Requests were made to extend the comment period.

EPA Response: The National Contingency Plan (NCP) requires that the RI, FS and Proposed Plan be provided to the public for review and comment for a period of at least 21 calendar days. The new proposed NCP requires a minimum 30 calendar day public comment period.

EPA has exceeded both of these requirements by providing a 64 calendar day public comment period on the RI, FS and Proposed Plan. The comment period was extended (at the December 14, 1988 public hearing) to January 23, 1989, from the original January 9, 1989 deadline.

2. Comment: Several PRPs stated that the RI report and FS were not readily available for review.

EPA Response: A draft RI report has been available to the general public at EPA since July 1987 and also in the City of Mountain View public library since August, 1987. The final RI report has been available at these respective locations since July, 1988. Furthermore, EPA in its general notice letters issued in August and September, 1988, notified the commenters and others of the availability of an administrative record that contained supporting documentation for the MEW study area. The FS was made available to the public in the EPA and Mountain View libraries at the beginning of the comment period November 21, 1988. In addition, copies of the FS were also available for purchase from Canonie Engineers, the preparers of the FS.

3. Comment: Several PRPs claimed that there were "inconsistences" between FS reports on reserve at the Mountain View Public Library, the FS report at the EPA library, and copies provided by Canonie Engineers.

EPA Response: EPA acknowledges these concerns, however, we believe any differences to be minor in nature and would not affect the scope of the FS report. Copies of the FS report were readily available for review at the EPA library during the entire public comment period.

4. Comment: One commenter wrote that EPA announcements regarding the review and comment period and public meetings needed to be more widely distributed.

EPA Response: Announcements regarding the MEW public comment period and the public meeting were published in "The View", "The Los Altos Town Crier", "The Times Tribune", and the "San Jose Mercury News" (Peninsula Extra Edition). In addition, EPA's Proposed Plan, which also announced the public comment period and public meeting, was sent to EPA's MEW mailing list that consists of over 100 names. We will also be periodically updating our mailing list and will contact local officials and community groups for assistance in updating that list.

5. Comment: A number of commenters claimed that they were not PRPs. Some of these commenters also cited references to other PRPs or inferred sources, in the RI report.

EPA Response: The determination of who is or who is not a PRP is not relevant to the selection of a remedy. Furthermore, in its August 8, 1988 approval of the RI report, "EPA neither agrees nor disagrees with the assumptions or assertions regarding 'inferred sources or other PRPs' as presented in the RI report." EPA makes its own determination of liability independent of the RI/FS process.

6. Comment: Several commenters who are PRPs wanted to know how other PRPs will be dealt with, how cleanup costs will be allocated, and who is responsible for cleanup.

EPA Response: EPA is currently evaluating PRPs to determine who will receive Special Notice letters for Remedial Design and Remedial Action (RD/RA) to 17 parties. The responsibility for cleanup lies with whomever EPA determines to be a PRP. The allocation of cleanup costs are usually decided among the PRPs.

7. Comment: Two PRPs wrote that remediation of the C and deep aquifers should be addressed as a separate operable unit. The reasons given were that the C and deep aquifer contamination is limited to localized areas, the contamination was not caused by the respective commenters, and, operation and maintenance cost will be increased.

EPA Response: EPA does not designate operable units to separate cost allocations among various PRPs. The commenters have offered no compelling technical or environmental reasons why there should be a separate operable unit for the C and deep aquifer remediation. EPA believes that including the deep aquifers in the comprehensive remedial plan for the entire MEW Study Area is the most efficient use of agency and PRP resources. Furthermore, 40 CFR Section 300.6 simply defines an operable unit, "as a discrete part of the entire response action that decreases a release, threat of release, or pathway of exposure."

The Following Selected Comments Concerning EPA's Process Were Submitted by Siltec

1. Comment: Page 1. Siltec claims that a copy of the final RI was not made available to them until January 13, 1989. Siltec has not had a reasonable opportunity to review or comment on all of RI's contents.

EPA Response: A draft RI has been in the Mountain View public library since July 1987. The final RI was delivered in July, 1988, to EPA and the Mountain View Public Library. Siltec has had ample time to review the RI since EPA stated at the October 1988 "kickoff" meeting attended by Siltec representatives, that the final RI was available for review in the EPA and Mountain View libraries.

Siltec seems to be arguing that EPA should have had a separate public notice for the RI, citing U.S. v. Seymour Recycling Corp. 679 F. Supp. 859 at 864. If that is Siltec's contention, EPA disagrees. EPA notes that a separate RI review process is simply not contemplated by CERCLA nor U.S. v. Seymour Recycling Corp. 679 F. Supp 859 (S.D.Ind. 1987). In that case, the court notes that, pursuant to CERCLA as amended by SARA, the generator defendants are entitled to comment on the selection of a remedy before the remedy is selected. In U.S. v. Seymour Recycling Corp., as here, EPA provided the generator defendants an opportunity to comment on the remedy before a selection of the remedy has been made.

EPA also notes that Siltec was given notice that it was a potential responsible party in the MEW area in May, 1985 and was given an opportunity to participate in the RI/FS process. Thus, Siltec was on notice that the RI/FS was being prepared, and therefore, Siltec should have been tracking the progress of the RI/FS.

2. Comment: Pages 3-4. Siltec has been unable to comment on the FS because of substantial uncertainty about the accuracy and validity of the FS distributed for public comment.

EPA Response: EPA disagrees with the statement that "there is substantial uncertainty about the accuracy and validity of the FS distributed for public comment." As stated above, the FS was available to the public in the EPA and Mountain View libraries at the beginning of the comment period, November 21, 1988. In addition, copies of the FS were also available for purchase from Canonie Engineers. Any inconsistency between the copies was minor in nature.

3. Comment: Siltec stated that "[T]he opportunity for meaningful comment is compromised where complete copies of relevant agency documents have not been made available in a timely fashion" citing the case of U.S. v. Rohm and Haas Co. Inc. 669 F. Supp. 672, 683.

EPA Response: The facts of U.S. v. Rohn and Haas Company, Inc. are very different than here. In particular, the public was given 5 days to submit comments in U.S. v. Rohm and Haas Company, Inc. Here the public, including Siltec, was given 64 days to submit comments.

4. Comment: Siltec recommends that cleanup of the C aquifer (the areas below the B-C aquitard) should be addressed as a separable operable unit as the term is defined at 40 CFR Section 300.6 and as permitted by 40 CFR Section 300.68(c).

EPA Response: 40 CFR Section 300.6 simply defines an operable unit as "a discrete part of the entire response action that decreases a release, threat of release, or pathway of exposure." EPA fails to see the benefit of addressing the C aquifer as a separate operable unit solely for cost allocation purposes.

The Following Selected Comments Concerning EPA's Process Were Submitted by Air Products

1. Comment: "EPA does not have the power to create or affect liability of persons at a 'Superfund site' simply by drawing the 'site boundary' at one location versus another."

EPA Response: The FS does not address the liability of persons at the MEW site. EPA notes that liability is determined by CERCLA Section 107, not the drawing of site boundaries.

2. Comment: "EPA lacks the authority under Section 104 to order Air Products to require testing."

EPA Response: Orders requiring testing under Section 104 are not addressed in the RI and FS. EPA notes Air Product's legal opinion.

Comments Concerning the Proposed Cleanup Goals

1. Comment: The Regional Water Quality Control Board (RWQCB) commented that the cleanup goal for the groundwater inside the slurry walls should be set at 5 parts per billion (ppb) -- the same goal set for the groundwater outside of the slurry walls. The Board commented that EPA's groundwater classification applies to all aquifers including aquifers within slurry walls.

EPA Response: EPA's Proposed Plan recommended a 5 ppb cleanup goal for the shallow aquifers. Although not specifically stated, this 5 ppb goal would also apply to the aquifers within the slurry walls.

2. Comment: The RWQCB also commented that the cleanup goal for soils within the slurry walls should be set at .5 parts per million (ppm) -- the same level for soils outside the slurry walls. The Board was concerned about relying solely on slurry walls to prevent migration of contamination "because the long term integrity of slurry walls has not been demonstrated."

EPA Response: In addition to pumping within the slurry walls (to assure an inward gradient), there will be continuous monitoring of water levels and chemical concentration inside and outside of the slurry walls. Performance monitoring will be an integral part of any RD/RA Consent Decree. In the event of a slurry wall failure, additional measures can be taken such as, modification of the walls and pumping rates, or applying more stringent cleanup levels inside the slurry walls.

3. Comment: The Santa Clara Valley Water District (SCVWD) commented that they would not prevent a well from tapping the shallow aquifers.

EPA Response: Comment acknowledged.

4. Comment: The SCVWD is concerned that a cleanup goal has not been established for the aquifers within the slurry walls.

EPA Response: See EPA response to comment no. 1.

5. Comment: The SCVWD commented that specific protocol should be developed for reviewing and evaluating the performance of the selected remedy.

EPA Response: The RD/RA process will incorporate specific criteria for evaluating the cleanup goals and the effectiveness of the remedy. The cleanup goals and remedy will be evaluated at least once every 5 years.

6. <u>Comment:</u> The SCVWD recommended that a cleanup goal of 0.8 ppb also be established for the shallow aquifers.

<u>EPA Response:</u> A 5 ppb cleanup goal is protective of human health, especially since these aquifers are not currently used for drinking water. The 5 ppb level also falls within EPA's acceptable risk range of 10^{-4} to 10^{-7}.

In addition, the cleanup goal may not even be technically feasible because the aquifers are relatively "tight" (low water bearing zones) and have a high clay content, thereby making chemical removal difficult and costly.

7. <u>Comment:</u> The League of Women Voters urged EPA to use a "hazard index" to establish cleanup goals instead of the Maximum Contaminant Level (MCL) for TCE. The League is concerned about the "mixtures of chemicals" and their effects and cited the IBM and Fairchild sites in San Jose where the hazard index was used.

<u>EPA Response:</u> EPA believes that a 5 ppb TCE cleanup goal for the shallow aquifers is protective of human health. See EPA response to the SCVWD.

The ratio of TCE to other chemicals (found at the site) is high enough that a 5 ppb cleanup of TCE will result in a cleanup of the other chemicals below their corresponding MCLs. The 5 ppb cleanup goal takes into account the additive effects of the chemicals found at the site, and the resulting risk falls within EPA's acceptable range of 10^{-4} to 10^{-7}.

The IBM and Fairchild San Jose sites have TCA as the dominant chemical. Drinking water wells have also been affected at the IBM and Fairchild sites in San Jose, while no drinking water wells have been impacted at MEW.

8. <u>Comment:</u> One commenter wrote that Alternative Concentrations Limits (ACLs) would be appropriate "if no health risk occurs through exposure by contact or through ingestion of the contaminated groundwater." The commenter questioned whether such exposures can be prevented.

<u>EPA Response:</u> EPA is not proposing the use of ACLs at this time. The applicability of ACLs will be determined during subsequent review periods, once the remedy has been implemented and periodically evaluated.

<u>The Following Selected Comments Concerning Cleanup Goals Were Submitted By Crosby, Heafly, Roach and May, a Law Firm Representing Sobrato Development</u>

1. <u>Comment:</u> The 5 ppb cleanup level for the shallow aquifers "is not necessary to protect human health and safety", and the cleanup level "is unreasonably burdensome and cost inefficient. The firm also wrote that the shallow aquifers "are not reasonably anticipated to become suppliers of drinking water in the near or distant future", and that the enforcement of existing institutional controls can be used to protect human health. Therefore, less stringent standards should be applied to the shallow aquifers namely 500 ppb.

EPA Response: It should first be noted that EPA has proposed cleanup goals rather than cleanup levels. These goals and the remedies will be evaluated periodically to determine if they are technically practical, and therefore they may be subject to modification.

EPA based its proposed cleanup goals on several factors: 1. The shallow aquifers are potential drinking water sources even though they are not currently being used for drinking. This determination is also consistent with the Regional Water Quality Control Board's Basin Plan and Non-Degradation Policy which are designed to protect natural resources; 2. The 5 ppb goal meets EPA's acceptable risk range of 10^{-4} to 10^{-7};. The 500 ppb cleanup level which the commenter is proposing would exceed this acceptable risk; 3. It is unlikely that all of the abandoned agriculture wells which are currently acting as conduits or are potential conduits threatening the deep (current drinking water) aquifers will ever be located and properly sealed. Experience has shown that abandoned wells (e.g., Rezendes Wells) can cause significant contamination to migrate from the shallow aquifers to the deep aquifers. Therefore, absent sealing all of the abandoned wells, it becomes necessary to reduce the contamination in the shallow aquifers. The 5 ppb level would then be the maximum level that could potentially migrate to the deep aquifers.

2. Comment: "The worst case scenario soil remediation application is inappropriate." The commenter objected to uniform application of the worst-case scenario to the entire MEW area. The commenter also stated that future use assumptions of the MEW site are inconsistent with the City of Mountain View General Plan and with California Health and Safety Code institutional controls.

EPA Response: Because multiple sources have impacted a common groundwater area with commingled contaminant plumes (which threaten a current drinking water supply), EPA believes that a uniform application of a reasonable "worst-case" scenario and a uniform application of cleanup goals is the most efficient method to assure the protection of public health. This is also consistent with the approach taken at other sites in Santa Clara Valley and the country. Although the City of Mountain View's General plan may currently call for industrial/commercial use of the site, General Plans and land use are subject to change. The site is also presently bordered by residences west of Whisman and on Moffett Naval Air Station, and a change in the electronics industry may make residential use of the site plausible in the future. Other than deed notifications, it is not clear to which institutional controls of the California Health and Safety Code the commenter is referring.

Response To Selected Comments From Sobrato

1. Comment: "The MEW FS purports to apply a percolation rate of 2 inches/year in calculating the allowable contamination concentrations in the soil. Such a percolation rate is considered extremely unlikely in properties, like SOBRATO's, which have been covered and contained by asphalt. In addition, surface runoff at the site is comprehensively routed to storm sewers and drains. Therefore, percolation rates on the SOBRATO properties should be expected to approach nearly zero."

EPA Response: Although field studies have not been conducted at the MEW site to determine the amount of water infiltrating through the topsoil, the literature describes exponentially decreasing infiltration rates following a rainstorm. However, more water may infiltrate to the aquifers in periods of long storms, especially following extended dry periods.

The scenario of calculating soil remediation levels, by assuming potential residential use rather than current industrial usage, is EPA policy. This policy has been consistently applied throughout other regions under similar circumstances. The rationale supporting this policy is that surface coverings and land use may change and, over the long term, institutional controls may be unreliable. The 2 inch/year percolation rate is applied consistently throughout the MEW area.

2. Comment: "We (Sobrato) would like to point out that if the rationale used as the basis for the California Assessment Manual (Ca. Admin. Code Title 22, Division 4, Chapter 30, Article 11) criteria is applied to the subject properties, the soil cleanup level would be, at a minimum, 5.0 mg/kg."

EPA Response: The criteria presented in the cited California Administrative Code defines a regulated hazardous waste and is not appropriate for determining a soil cleanup level.

The Following Selected Comments Were Submitted by Heller, Ehrman, White & McAuliffe, Attorneys for NEC Electronics, Inc.

1. Comment: The intended application of the "No Further Action" (monitoring only) alternative is unclear, since it is discussed primarily for Zone 1 soils located inside slurry walls.

EPA Response: EPA does not understand the comment, as we believe the application of the "No Further Action" alternative is adequately explained for each of the remedial alternatives in Chapter 8 of the FS.

2. Comment: No estimates of the remediation periods for "Partial Excavation with Ambient Temperature Aeration" (Alternative 3) and "Partial EXcavation and Ambient Temperature Aeration with In Situ Soil Aeration" (Alternative 4) are provided.

EPA Response: The time frame for this alternative would be governed by the factors identified in Appendices G and H of the FS, which state that the remediation of excavated soils requires 48 hours of disking soils in six inch lifts. The number of lifts required would depend upon the volume of soil to be remediated. Table O-22 of Appendix O provides the volume of soils to be excavated and remediated.

3. Comment: NEC Electronics requested the "latitude" to explore other "options" including those remedial methods outlined in the FS, and other methods in order to achieve the ROD cleanup goals for vadose zone soils.

EPA Response: EPA anticipates that the MEW FS will be applied as appropriate to other sites in the MEW area. The remedy, in-situ vapor extraction, was selected based on a thorough evaluation of the alternatives. In addition, soil excavation and treatment by aeration was also selected, based on prior implementation in MEW. If new information or alternatives are brought to the attention of the agency in the future, the EPA may consider them.

4. Comment: It is highly unlikely that contamination in the Rezendes Wells could have come from NEC's 501 Ellis Street facilities.

EPA Response: The specific origins of the Rezendes Wells' contamination is not an issue in the selection of a remedy, nor is liability for the deep aquifers, since Superfund liability is strict, joint, and several.

5. Comment: When shallow groundwater is mixed with deep aquifer groundwater in the same treatment system, there will be a "deleterious effect on the water so treated." This mixed groundwater will have limited uses "if surface discharge is rejected as an alternative after treatment."

EPA Response: While this appears to be mainly true for the A and B1 aquifers, most of the B2 and B3 aquifers would not require treatment for major ions and coliform bacteria. See Table 1-6 (Volume I) of the Remedial Investigation Report. Furthermore, the "deleterious effects" of mixing the deep and shallow ground waters in a treatment system will ultimately be determined by the end use of the water.

6. Comment: The effects of long term pumping of the shallow aquifers should be carefully evaluated in light of recent experience with a similar system at other sites in the region. It is not clear if recharge rates and aquifer yields have been evaluated.

EPA Response: While it is not clear to which other sites in the region the commenter is referring, aquifer yields and recharge rates will be thoroughly evaluated during RD and before any full scale remediation beings. In addition, water levels, subsidence, etc. will be carefully monitored during RA.

7. Comment: There is no indication that scaling and biological growth in the air stripping columns have been considered in treatment facility design or in the operation and maintenance costs (O&M) shown in the FS.

EPA Response: The operation and maintenance cost estimates for the treatment systems include packing replacement and acid feed system maintenance, which are intended to solve or prevent scaling and biological growth problems. (Appendices J and K).

8. Comment: "There is no indication that the FS has considered the costs of complete replacement of treatment units in the annual O&M costs or the capital costs for the facilities."

EPA Response: The annual operation and maintenance costs for each treatment system includes replacement costs (e.g., $6,000 for blower repair or replacement,

$11,500 for packing replacement, $14,000 to $22,000 for the acid feed system, $1,000 for electrical controls, and $3,000 to $4,000 for the air stripper tower).

Response To Selected Comments From Siltec

Comments on Soil Remediation Levels

1. General Comment: The proposed soil remediation level of 0.5 ppm TCE for all soils throughout the MEW site which lie outside the slurry walls is not adequately supported by the FS. We (Siltec) believe that a 0.5 ppm TCE soil remediation level is incorrectly calculated and incorrectly expressed for several reasons.

2. Comment: The FS states that supporting justification and analysis for selection of a soil remediation level is based on a "worst case" hypothetical exposure scenario where the MEW site would be converted to an unpaved residential area characterized by open lawns and unsewered roof drains allowing maximum infiltration and subsequent percolation (FS, Appendix Q, p. Q-10). We (Siltec) believe the RI/FS errs in using the worst case analysis to identify the soil remediation level. An appropriate analysis should consider other more probable scenarios as the basis for selection of soil remedy for the MEW Study Area.

EPA Response to Comments 1 and 2: The scenario of calculating soil remediation levels by assuming potential residential exposure is EPA policy. This policy has been consistently applied throughout other regions under similar circumstances. The rationale supporting this policy is that land use can change and, over the long term, institutional controls (e.g., zoning and local planning) may not be reliable.

In addition, the modeling scenario in Appendix Q is certainly not an extreme worst case. The following items are examples:

> The model allows for instantaneous dilution with the groundwater aquifers below the contaminated soil zone. In the real world, instantaneous mixing would not occur leading to higher concentrations in the upper portion of the aquifer than predicted by the model. The instantaneous mixing given by the model allows for a dilution of 89 times (0.0112). At many sites throughout the country, where similar evaluations are performed, no groundwater dilution would be allowed. The given model assumes the receptor to be at the boundary of the contaminated zone. In many instances, a theoretical receptor's well would be modeled directly below the site. If all of the examples given above were incorporated into the model, much higher receptor concentrations would be predicted. The result would be much lower soil clean up levels.

Because of the facts given above, the model is considered a reasonable worst case scenario, not an extreme worst case. This is consistent with EPA guidance.

3. Comment: Further time sensitive analysis such as the analysis provided in Table Q-9 is useful to evaluate the degree of potential harm as measured by various conservative assumptions. Table Q-9, for example, shows that health based

levels of TCE in the aquifer would be approached for only one year in a thirty-year period and that otherwise the level of TCE in groundwater would be below those levels.

EPA Response: Table Q-9 represents one case (conservative in concentration and percolation, not conservative in Kd) from the potential cases given on Table Q-3. Other cases could be performed. Given different scenarios, (e.g., longer areas, higher soil concentrations and lower dilution), long term elevated groundwater concentrations could easily be greater than 5 ug/L.

4. Comment: The worst-case analysis used to support a soil remediation level of 0.5 ppm TCE in soil assumes a percolation rate of 2 inches/year. However, the EPA approved model used to arrive at percolation rates is stated to result in "virtually no percolation to the saturated zone." The FS use of a 2 inch percolation rate is based on a theoretical possibility of the effect of prolonged Pacific frontal systems. No justification for or analysis of the effect of the frontal system is given by the FS. If a worst case analysis is used at all, the soil remediation level analysis should be calculated using a lower percolation rate.

EPA Response: Although field studies have not been conducted at the MEW site to determine the amount of water infiltrating through the topsoil, the literature describes exponentially decreasing infiltration rates following a rainstorm. However, more water may infiltrate to the aquifers in periods of long storms, especially following extended dry periods.

Assumptions used in the EPA model resulted in calculating little or no infiltration in the MEW area. This model uses average monthly precipitation and temperatures to calculate average monthly evapotranspiration rates and percolation rates. As a result, the percolation model does not consider the single storm event. Infiltration calculations based on single storm events may yield higher computed percolation rates. Also, the percolation model uses only precipitation as a water input. Additional surface water recharge can be caused by irrigation related to landscaping. Based on these factors and conservative engineering judgment, the FS used a percolation rate of two inches/year.

5. Comment: The worst-case scenario is inconsistently applied for soil remediation levels. The 1 ppm TCE soil remediation level for inside the slurry walls is based on the implicit assumption that those areas will remain under industrial/commercial control necessary to maintain effectiveness of the slurry walls.

EPA Response: A residential reasonable worst-case scenario was uniformly applied throughout the MEW area. The 1 ppm TCE cleanup goal was based on the added degree of protection provided by the slurry walls and the continued monitoring and pumping which will be part of the overall remedy, regardless of the existing or potential land use.

6. Comment: The worst case assumption stated in the FS at Appendix Q uses a retardation factor of 6.0. Based on Appendix P-A, the worst case retardation factor discovered by the analysis lies at a minimum range of 6.5-8.5 as measured

by laboratory data and at 7.0 as measured by field data. Any calculations involving worst case assumptions should use these higher retardation factors.

EPA Response: Table Q-9 is based on R of 12.0. Use of a R of 6.0 is conservative but certainly not worst case. Many adsorption R values may be as low as 2.2 for TCE. Desorption R values may be much higher. "Worst case" analysis should use lower R values not higher as implied.

7. Comment: The soil remediation analysis is ostensibly calculated so as to demonstrate protection of the underlying aquifer as measured by a health based concentration of 5 ppb TCE in the aquifer. On this basis, the FS concludes that 0.5 ppm TCE in soil is an appropriate soil remediation level. However, the solution to the equations provided in the analysis have apparently been solved to result in no more than 4.85 ppb TCE in the underlying aquifer.

EPA Response: The difference between 4.85 and 5.0 and the use of "standard scientific conventions" (i.e., significant figures) versus "nonstandard convention" is trivial and meaningless to argue over given the accuracy of the methodology and the assumptions. For example, the difference between 0.0111 and 0.0112 (the dilution factor) is not meaningful or the difference is not significant.

8. Comment: ". . . the FS incorrectly calculates the value for $(Q\ in)_g$. . ."

EPA Response: The referenced calculations have been reviewed and found to be correct. A typographical error exists in $(Qin)_g$, which should be expressed in ft^3/year. Despite the typographical error, the correct units were actually used and the calculation in the FS are correct as stated.

9. Comment: " . . . the actual analysis provided to support the soil remediation level is expressed as a concentration of TCE in soil per specified unit of available square surface area through which percolation may occur. Based on this analysis, it is inadequate to express the remediation level for the entire site without reference to the corresponding surface area."

EPA Response: Using the site specific approach given in Appendix Q requires areas of contamination to be used in the calculations. A similar calculation can be made using percolation through a unit surface area through a given mass resulting in flux into groundwater. The remediation levels calculated from these approaches are presented in terms of mg/kg. Soil clean-up levels need to be in terms of mg/kg for application of an area-wide clean-up goal and for verification of remediation.

10. Comment: The FS is unclear as to the use of recommended soil cleanup levels (RSCLs).

EPA Response: RSCLs were not used to determine soil cleanup levels at MEW. In fact, RSCLs are outdated and are no longer used, even by the California Department of Health Services.

11. <u>Comment:</u> Siltec recommended that a cleanup level greater than 1 ppm for TCE be set, based on soil cleanup levels "found at" other relevant Superfund sites. The sites referred to are found in New Hampshire, Rhode Island and Michigan.

<u>EPA Response:</u> A cleanup level established for one site (especially in another part of the country) is not necessarily adequate at other sites. Site characteristics can vary greatly (e.g., soil, groundwater, geology, affected populations, etc.) and, therefore, each site must be evaluated on a case-by-case basis.

11. <u>Comment:</u> The RI report incorrectly stated that Siltec used TCA.

<u>EPA Response:</u> Comment noted, however, EPA in its August 8, 1988 approval letter for the RI stated, "EPA neither agrees nor disagrees with the assumptions or assertions regarding 'inferred sources' or 'other PRPs' as presented in the RI report."

13. <u>Comment:</u> ". . . TCE contamination in the groundwater is not attributable to leaks from an above ground storage tank and groundwater flow beneath Siltec property is to the northeast."

<u>EPA Response:</u> See above response. In its RI approval letter, EPA also stated, "EPA neither agrees nor disagrees with the configurations and boundaries of the chemical plumes, or with the graphical interpretation of the potentiometric surface/water table of each aquifer as presented in the RI report." "The configuration and boundaries are, however, adequate to evaluate remedial alternatives." The points raised by Siltec are minor since they deal with only a small portion of the MEW area, and therefore are unlikely to have any bearing on the selection of remedial alternatives for the overall area. Furthermore, well elevation data and TCE concentration contour plumes have been reviewed and the data substantiates that the groundwater (in the shallow aquifers) flows in a north or northwest direction, consistent with the RI report.

14. <u>Comment:</u> Soil remediation at Siltec would be unnecessary if soil remediation levels were "properly derived", therefore, the statement in the FS that on-site soil remediation is necessary at Siltec should be stricken from the text.

<u>EPA Response:</u> Soil remediation levels for the MEW area have been properly derived. Individual sites which will require soil remediation will be determined by EPA on a case-by-case basis.

15. <u>Comment:</u> Siltec believes that the effects of sanitary and storm sewers as potential conduits in the local study area (LSA) have not been adequately studied and that further investigation may show that sewers in the LSA do act as conduits.

<u>EPA Response:</u> An adequate evaluation of potential horizontal conduits was performed by Fairchild, Intel, and Raytheon as part of the RI. The results of the investigation were included in the RI report. The report concluded that horizontal conduits (at least within the local study area) are not a problem. If Siltec wishes to perform an additional study, it may do so during RD/RA.

The Following Selected Comments Were Submitted by the League of Women Voters

1. Comment: Identification of all the responsible parties should be expedited to increase the financial resources needed for cleanup. "Close monitoring by EPA is also essential to guarantee that all polluters have been identified and are participating in the cleanup."

EPA Response: EPA has issued "Special Notice" letters for cleanup liability to 17 Potentially Responsible Parties (PRPs) in the MEW area. Agency negotiations with the PRPs for cleanup and oversight costs will commence shortly. In addition, as cleanup progresses, monitoring data will be evaluated to determine if other sources have contributed or are contributing to the MEW contamination.

2. Comment: The League agrees with the "pump and treat alternative" for the shallow aquifers.

EPA Response: Comment noted.

3. Comment: The Proposed Plan should identify ways of reusing extracted groundwater.

EPA Response: Groundwater reuse is currently being evaluated and will be incorporated into the ROD and the RD/RA Consent Decree.

The Following Comments Were Submitted by the U.S. Navy

General Comments

1. "Unlike other FS reports, this report does not present supporting engineering calculations on treatment sizing, pumping requirements, simulated drawdown cones, or construction materials and methods. As such, the document is generic in nature and essentially requires the reader to assume that the black box system is optimal."

EPA Response: Such detailed design information is typically not provided in the FS because it is unnecessary, and consequently will be presented during Remedial Design (RD).

2. "The report does not present specific design information for water treatment, soils aeration, and several other alternatives discussed. Without this fundamental information, it is impossible to critique the authors conclusions."

EPA Response: The information presented in the report is sufficient for evaluating various alternatives. Specific design information will be presented during RD.

3. "A groundwater model is not specified, and pumping specifics (e.g., rate, duration, equipment) are not provided."

EPA Response: The information regarding the groundwater model can be found in Appendix P of the Feasibility Study.

4. "Offsite remediation is mentioned throughout the document in a cursory manner, yet a number of pumping wells are shown on NAS Moffett Field property and a treatment system is shown on NASA property. How was the information gathered in the NAS Moffett Field Remedial Investigation incorporated into the treatment designs and ground water extraction schemes?"

EPA Response: As the FS report states, the number and location of pumping wells and treatment systems is for costing estimates only. The actual number and location of these units will be provided during RD. Also, site specific sources on Moffett Field were not incorporated into the treatment designs and extraction schemes.

5. "The document does not present information as to the potential timing for installation of off site or on site remediation. Due to other investigations currently ongoing, extensive coordination is needed. To date, what coordination is proposed?"

EPA Response: Timing and coordination for well installation will be part of the Remedial Design and Remedial Action (RD/RA) negotiations process, and therefore are not incorporated into the FS.

6. "It was difficult to determine if the unsaturated zone model is accurate without supporting calculations. In addition, how is differentiation made between vapor phase transport and liquid phase transport?"

EPA Response: Supporting calculations for the unsaturated zone model are found in Appendix P of the FS. Vapor phase transport was not considered.

Executive Summary

1. "ES-1. Uncontrolled sources are cited as present and impacting potential remediation. These sources are not clearly defined in the text nor are their impacts."

EPA Response: Uncontrolled sources will be defined during the RD/RA phase and as other PRPs are included in the process.

2. "ES-1. It is stated that the FS is designed to adequately address unknown or uncontrolled sources of pollution. No reference was found in the text that presents how uncontrolled sources are handled in the FS design process."

EPA Response: See response above.

3. "ES-2. Chemicals have been detected in all 5 aquifers. Was there any investigation as to the vertical distribution of chemicals in any of the aquifers, particularly the C aquifer?"

EPA Response: Section 4.0 of the Remedial Investigation Report (July, 1987 and revised June, 1988) contains the results of a thorough investigation of the chemical distribution in soils and groundwater in all aquifers.

4. "ES-2. How was the total volume of TCE, TCA, etc. calculated? This was not described in the text."

EPA Response: The estimation of volumes of chemicals in various aquifers is described in Section 4.3.2 (pp. 4-63 through 4-66) of the RI Report.

5. "Shallow aquifers beneath the site are cited by the RWQCB as being a potential drinking water source. This argument appears unfounded since the general water quality is poor and the aquifers thin, discontinuous, and low yielding. How much potential does EPA or RWQCB see for the shallow aquifers being utilized as a drinking water source?"

EPA Response: While the water quality and yields of the shallow aquifers may be lesser in relation to the deep aquifers, the shallow aquifers near the site have been used for drinking water in the past, according to the Santa Clara Valley Water District. Although currently no one is using the shallow aquifers for drinking water, the aquifers do meet EPA's groundwater classification criteria for potential drinking water sources and are also protected under the RWQCB's Basin Plan and Non-Degradation policy. Both agencies regard the shallow aquifers as a resource that should be protected and restored.

6. "ES-5. The upper foot of soil is not considered for remediation based on health risk. Was potential leaching of these materials and subsequent concentrations in lower zones considered?"

EPA Response: The Endangerment Assessment prepared by EPA concluded that there is very little contamination present in surface soils, therefore, leaching (from the surface soils) is unlikely to be a problem.

7. "ES-7. Throughout the document, maintaining an inward and upward hydraulic gradient has been discussed. However, calculations on how much water should be pumped to establish this gradient or exactly what minimum magnitude of the gradient is necessary but not present."

EPA Response: Water pumpage will be determined during RD/RA.

Chapter 1

1. "P12. Recent groundwater extraction from within the slurry walls is presented. There does not appear to be any reference in the text as to the quantity of water being pumped or the quality of effluent. This type of information is critical in evaluating appropriate remedial alternatives. No reference is made as to the established NPDES levels to Stevens Creek or the POTW. This information is vital in establishing cost effective disposal options."

EPA Response: EPA does not believe that this information is necessary for the FS report. The information will be provided during the RD phase. NPDES levels may be obtained from the RWQCB.

Chapter 2

1. "P-17. Three additional recovery wells were added in 1985. What was the rationale behind their installation? Where are they? Do they all couple into one treatment system? If so, was the original system redesigned? Where is the treatment system?"

2. "P-17. Twenty-one (26?) recovery wells are apparently now operating. A schematic of the operating system(s) is essential along with design details and rationale. None of this information is provided making a good review of additional pump and treat scenarios difficult."

3. "P-18. Three stripping towers are said to treat some portion of the recovered water. What portion goes to the POTW and to Stevens Creek?"

EPA Response: The above information is not necessary for the FS and will be provided during the RD phase.

4. "P-22. The Raytheon slurry wall is said to partially penetrate the B2 aquifer. Why was the wall keyed into permeable materials?"

EPA Response: This information may be obtained by reading the Raytheon "Slurry Wall Construction Report" Golder Associates, January 1988, which is on file at EPA and is also part of the administrative record.

5. "P-23. 1,300 lbs. and 230 lbs. of VOCs were removed from two plots. What percentage recovery of VOCs was achieved?"

EPA Response: This will not be known until the remedy has been completed.

6. "P-24. In-situ tests apparently suggest an effective radius of influence of 40 feet for venting wells. The specifics of these tests were not presented. What were the physical soil properties? Soil moisture and temperature? Total concentration of chemicals in the soil? Generally, in the fine grained soils, vent wells are placed on 5 to 10 feet centers. Although it is not possible to check the authors' calculations, previous experience suggests that the vent system as given may not be adequate."

EPA Response: The information may be found in a report titled, "Soil Vapor Extraction Study", Raytheon Company, prepared by Harding Lawson Associates dated, February 8, 1988. The report is available for review at EPA and is also part of the administrative record.

7. "P-26. The slurry wall around Fairchild building 9 appears to be built through a highly contaminated area. Why? (See figure 2-1.6)"

EPA Response: This information is not relevant to the proposed cleanup plan.

8. "P-27. Metals have been detected in the groundwater but are essentially discounted because of the statement: "Metals...are not very mobile in groundwater...". The presence of metals in the soils and groundwater should be considered in the design of treatment alternatives. Metals present in the high ppb range may have adverse affects on potential treatment options such as biological reactors and promote scaling in air stripping towers."

EPA Response: Metals will be considered during RD.

9. "P-33. Chemical concentrations were detected in Stevens Creek. What were the concentrations of these chemicals? How were these chemicals addressed in NPDES permitting at the site?"

EPA Response: This information is not relevant to the FS. NPDES permitting requirements may be obtained from the RWQCB.

10."P-33. How were the synergistic and antagonistic effects of the various non target chemicals addressed when designing water treatment systems? For example, is fouling of the aeration tower packing material due to high levels of inorganics a potential problem at the MEW remediation area?

EPA Response: This information will be developed during RD.

11. "P-34. Chemicals detected in samples below 10X or 5x associated field blanks are reported as non-detected. Which specific compounds other than the four chemicals listed fell under the 10X rule? On what basis was the 5X rule chosen?"

EPA Response: This information can be found in the "Endangerment Assessment" report available at EPA and in the City of Mountain View Public Library.

12. "P-36. The mobility of metals is again mentioned yet there is no discussion on the redox potential, precipitation or exchange of these chemicals in the presence of soil components such as humic acids. Lead for example can be solubilized by some naturally occurring acids and some lead compounds produced are classified as soluble. If lead is able to come in contact with estuarine benthic microbes through surface water transport or shallow groundwater flow, these microbes can methylate lead to form tetramethyl lead which is volatile and more toxic. Although situations like the one described are not common, a more comprehensive review of metals contamination should be considered."

EPA Response: See above response and response to comment 8.

Chapter 3

1. "P-54. In paragraph 2, soil remediation levels are left open, yet all remedial alternatives are based on 1 ppm and 0.5 ppm TCE cleanup levels. This apparent inconsistency needs clarification."

EPA Response: Soil remediation levels inside the slurry walls are "left open" only if Alternative Concentration Levels (ACLs) are chosen as cleanup levels for aquifers inside the slurry walls. EPA has chosen Maximum Contaminant Levels (MCLs) for the shallow aquifers including those located inside slurry walls.

2. "P-57. The federal pre-treatment guidelines for toxics of 1.37 ppm from manufacturing facilities would be relevant only if the local treatment works would agree to use this guideline."

<u>EPA Response:</u> Correct.

Chapter 5

1. "P-92/106. In-situ biological treatment is considered only to a very limited extent. Specifically, the authors address biodegradation in an undisturbed state. Further they discount this option quickly by citing a single study performed by Stanford University. No significant conclusions were drawn from this work.

Aerobic biodegradation can be performed using an above grade landfarming technique. This technique is very successful with aromatic hydrocarbons and would augment soil aeration. The technique can be used with similar farm equipment employed by the aeration alternative. Although biodegradation alone is not a plausible solution, biodegradation using marine bacteria, sewage sludge or some strains of soil bacteria can enhance the remove of chlorinated alphatics sorbed to the soil matrix and should be considered."

<u>EPA Response:</u> Comment noted.

2. "P-95. On site treatment options deal exclusively with volatile compounds. The extracted water stream will contain numerous other chemicals such as iron, magnesium, calcium carbonate, and heavy metals. These compounds must be treated prior to entry into an aeration tower to prevent fouling and to promote treatment to the limits set. Treatment units including precipitation tanks and mixers, in line filtration, and multimedia filtration should be addressed."

<u>EPA Response:</u> This will be addressed during RD.

3. "P-101. The chemical characteristics listed are properties associated with volatilization and sorption. Characteristics such as pH, TDS, BOD and TSS need to be quantified prior to design of water treatment."

<u>EPA Response:</u> Comment noted.

4. "P-103. The contention that additional surface capping would have a minimal influence on infiltration should be supported by calculations provided in the document."

<u>EPA Response:</u> Most of the site (approx. 80%) is already capped. Therefore, additional capping will have little, if any, influence.

5. "P-104. It is contended that excavation would require demolition of several buildings. Which buildings?"

EPA Response: Potentially, any building situated over soil contamination.

6. "P-105. Limited space available for stockpiling soils is given as a reason to discard excavation, yet landfarming soils for volatilization of organics is passed through for consideration. If space is limited, where would the above grade landfarming be accomplished?"

EPA Response: This information will be developed during RD.

7. "P-108. Aeration is described as not being effective on phenol. However, no treatment method is offered for phenol in lieu of aeration. Why?"

EPA Response: As phenols in soil have not been quantitatively defined, information will be developed during RD, and incorporated as necessary into the treatment methods.

8. "P-108. What constitutes successful dewatering? (para 4). If vapor extraction is to be successful, what is the maximum residual water content in sandy soils? Cohesive soils?"

EPA Response: This information will be developed during RD.

9. "P-108. Adverse settling due to dewatering was encountered. What was the magnitude of this settlement? Why was this situation not reviewed in Chapter 9 with respect to the long term pumping scheme?"

EPA Response: It is not known if settlement was due in part, solely, or at all because of dewatering. Additional information will be developed during RD/RA.

10. "P-108. It is stated that settling will not affect slurry wall integrity. Were calculations performed to support this contention?"

EPA Response: The FS Report states that settlement conditions are not expected to affect the integrity of the slurry walls. Calculations to support this conclusion were performed by consultants for Raytheon independent of the FS report.

11. "P-109. The report claims that in-situ aeration is applicable to soils beneath buildings. It is not clear from the supplied figures how soils beneath buildings are being remediated."

EPA Response: Soils beneath buildings are not currently being remediated. Those areas will be addressed during RD/RA.

12. "P-109. What are the serious concerns about steam injections?"

13. "P-109. What are the potential adverse effects of steam flushing? They are not presented in the discussion."

EPA Response: The concerns about steam injections are that the levels of development and field experience are minimal. Massive injections of steam would result in the significant elevation of subsurface soil temperatures and pore pressures under structures on the site. These temperatures and pressures could result in possible injuries to personnel and disruption of industrial operations due to 1. heave or settlement and/or 2. the accidental uncontrolled release of steam to the surface.

14. "P-112. The arguments that flushing may increase the boundaries of chemical-bearing groundwater and that the flow injected water cannot be controlled are not valid. If injection wells are properly placed upgradient of the plume and extraction wells placed downgradient, a closed loop system can be maintained. Flushing increases the hydraulic gradient and can substantially reduce remediation time. Further, flow controllers connected to sensors in monitor wells can maintain a predetermined hydraulic head."

EPA Response: Sections 5.3.11, 5.3.25, 6.2.9, 7.2.2.4, and 7.2.3.4 of the FS explain why flushing is not considered for site remediation.

15. "P-112. 1. It is stated in the FS that it is unlikely that enough water could be injected to alter the piezometric surface. This argument contradicts the previous statement regarding complex stratigraphy. The aquifers are low yielding, discontinuous and relatively thin bedded. All of these physical characteristics suggest an induced head could be applied. 2. Were calculations performed or a flow model used to show the effects of water injection?"

EPA Response: 1. The text of the FS does not contradict the above statement. The text does state that due to the "extremely variable permeabilities . . . it (is) impossible to ensure that adequate flushing rates can be maintained in all . . . areas. Also, it is unlikely that it will be possible to inject groundwater at a rate that would significantly alter water levels or piezometric surfaces in areas not in the immediate vicinity of the injection well". 2. No.

Chapter 7

1. "P-160. An 80 foot square grid would be required according to section 7.2.1.2. Earlier in the report, a 35 foot spacing was presented."

EPA Response: The exact spacing is unknown at this time, but will be determined during RA.

2. "P-160. In figures 7.2-1 a-c, extraction wells are shown but air inlet wells are not shown. The text describes inlet/extraction wells. Is this a pump in, pull out process or just vapor extraction?"

EPA Response: The process will be determined during RD.

Chapter 9

1. "P-260. Stevens Creek is proposed as the ultimate receptor for treated groundwater although it is not specifically stated in this chapter. How will the added flow affect the stream channel?"

EPA Response: As described in Section 2.2 (pp 2-4) of the RI Report, Stevens Creek is an intermittent stream. Therefore, the addition of a year-round flow of treated groundwater from MEW Area remedial actions might change portions of the creek downstream of groundwater discharge points to a perennial condition, to the extent that the discharge flow exceeded local stream bed percolation capacity. However, the proposed flow of treated groundwater is not expected to be large enough, when compared to normal storm run off, to materially affect the channel.

2. "P-260. Have channel hydraulics been modelled using the HEC-1 or similar flood routing scheme to ensure that the added water will not create a local flooding problem?"

EPA Response: No.

3. "P-245. Seven tenths of a pound of TCE is considered to be de minimus. How is this value calculated (weight or volume basis)? What criteria is used for determining the volume or weight to test?"

EPA Response: The term "de minimus" was developed by Fairchild, Intel, and Raytheon to describe certain "minor" contaminated areas. EPA does not use this terminology to describe contaminated areas. Calculations and criteria may be found in Appendix O of the FS report.

4. "P-245. How was the pumping scheme outside the slurry walls designed to ensure that an upward gradient is maintained inside the slurry walls? If the groundwater surface is sufficiently suppressed outside the walls then inside pumping is negated."

EPA Response: The gradients are currently being monitored and will be monitored during RD/RA.

5. "P-260. Why are only B1 and A aquifer wells proposed offsite in the downgradient direction?"

EPA Response: Because there is no contamination downgradient in the B2 and B3 aquifers.

6. "P-260. What is the rationale for placement of wells within NAS Moffett Field? Was flow modelling performed?"

EPA Response: Wells were placed in relation to the contamination plume. Flow modelling was not performed.

7. "P-260. Since chemical transport modelling was accomplished in only two dimensions, how were the effects of drawdown of chemicals through shallow aquitards considered?"

EPA Response: The effects of drawdown of chemicals through shallow aquitards were not considered since the model assumes that the aquifer is confined.

8. "P-261. Air stripping and activated carbon filtration are listed as treatment components. Will these systems require continuous monitoring?"

EPA Response: No.

9. "P-261. What are the estimated carbon use rates and packing life spans? What other components comprise the treatment systems? How much area will be required?"

10. "P-261. How will utilities be handled for the off site systems?"

11. "P-266. What is the rationale for the placement of the three "C" aquifer wells? What are the proposed pumping rates? Will the higher volume pumped from the "C" aquifer have a tendency to dilute the waste stream from the lower yielding upper aquifer wells? If so, what is the expected average concentration of chemicals on the influent side of the air stripper?"

EPA Response: The information for questions 9-11 will be developed during RD.

12. "P-267. The Operation and Maintenance costs are not well defined in the appendices. How was the 2.9 million dollars of annual O&M derived for the off site remediation scheme? How many treatment systems are included in the off site program?"

EPA Response: The O&M costs are adequate for the purposes of the FS. The exact number of treatment systems will be developed during RD.

13. "Figure 9.2-4. Some fairly extensive piping is shown on NAS Moffett Field property. How would this piping be installed? Have the numerous subgrade utilities on the facility been factored into the estimated cost?"

EPA Response: The drawn piping is a conceptual design and the installation will be refined during RD. Yes.

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29	06/24/88	Dennis L. Curran Canonie	C.R. Bostic Fairchild	Ltr: Information Needed on CDM Silva Well Model	1
30	07/05/88	C.R. Bostic Fairchild	Glenn R. Kistner EPA Region 9	Ltr: CDM Modeling Reports	2
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32	08/08/88	Phil Bobel EPA Region 9	George Gullage Raytheon	Ltr: Approval Of 6/15/88 RI Report	2
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34	09/02/88	ICF - Clement	Camp Dresser & McKee	Endangerment Assessment	215
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39	11/01/88	Canonie	Fairchild, Intel & Raytheon	Draft Rpt: Feasibility Study, M-E-W Area, Mt. View, CA	1100

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02/01/86	3.00	EPA-9 Remedial Response Program		National Priorities List (NPL) Site Fairchild Camera & Instrument Corp., Mtn. View, CA	10
05/01/86	4.00	EPA-9		Environmental News: New Contamination Found in Mtn. View's Deep Aquifer. w/map.	2
07/07/86	5.00	Michael Kent Research Assoc. Citizens for a Better Environment	Robert Stern EPA Community Relations Coordinator EPA-9	Comments on Fairchild Semiconductor Interim Remedial Action Proposal.	3
07/21/86	6.00	Chet Lauchner Director - Facilities Planning, Int'l Ops., Siltec Corp	Glenn Kistner EPA-9	Comments on "Interim Remedial Actions, Farichild Semiconductor Corporation, Mtn. View Facility " Draft Report by Canonie 6/86	3
07/28/86	7.00	Ted Smith Executive Director Silicon Valley Toxics Coalition	Robert Stern EPA Community Relations Coordinator EPA-9	Comments on Fairchild Semiconductor Interim Cleanup	2
08/22/86	8.00	Harry Seraydarian EPA Region 9	Chet Lauchner Siltec	Ltr: Response to 7/21 & 08/07/86 Ltr. about Fairchild Slurry Wall	2
10/01/86	8.10	CDM		Soil Sampling & Tank Inventory Data Compilation.	153
01/09/88	8.90	Dianne McKenna Santa Clara, Board of Supervisor	Glenn Kistner EPA Region 9	Ltr: Comment on the Clean-up Plan	1

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06/01/88	10.00	Lorence D. Wilson Santa Clara Valley Water District	Glenn R. Kistner EPA Region 9	Ltr: Closure of Franzia & Silva Wells	1
06/15/88	11.00	Glenn Kistner RPM EPA-9	George Gullage Proj. Coordinator Ratheon Co.	General Comments on Draft FS for MEW Study Area, w/TL to George Gullage 6/15/88	6
06/22/88	12.00	Roger B James Executive Officer CRWQCB-SF	Philip Bobel EPA-9	Comments on the MEW Feasibility Study by Canonie 5/3/88	4
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06/28/88	14.00	NEC Electronics, Inc.		Technical Review Comments Remedial Investigation Report RI/FS MEW Area, Mtn. View CA W/LTR to Glenn Kistner 6/28/88. w/charts & maps.	21
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09/14/88	16.00	George A. Gullage Raytheon	Glenn Kistner EPA Region 9	Ltr: Comments on Final Draft Endangerment Assessment	2
09/15/88	17.00	Rick Robison Reg. 2 - Toxic Substances Control Division CADOHS	Glenn Kistner RPM EPA-9	CADOHS Comments on MEW Draft FS Report 8/16/88 Revision	2
10/00/88	18.00	Canonie		Rpt: Sampling Plan Addendum No. 2 Walker Drive Investigation RI/FS	9
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10/21/88	21.10	CDM		Evaluation of Potential Conduits in the Local Study Area, MEW (Update of 5/9/88 Document).	34
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10/25/88	23.00	Bryan M. Rector	Glenn Kistner EPA Region 9	Intel Mt. View Ground Water Data Base Rpt. From 10/86 - 7/88 attached with Lab Analytical Rpts, Cover letter, Airbill, Transmittal Letter	850
11/00/88	24.00	EPA	Public	Fact Sheet	1
11/10/88	25.00	Glenn R. Kistner EPA Region 9	George Gullage Raytheon	Ltr: Approval of Sampling Plan Addendum No. 2 Walker Drive Investigation RI/FS But Not of Objective of the Plan	2
11/21/88	26.00	C. Robert Bostic Schlumberger	Philip Bobel EPA Region 9	Ltr: Intel's RI/EA/FS for Lot #3 & Concern about Separate ROD	2
11/23/88	27.00	Phil Bobel EPA Region 9	George Gullage Raytheon	Ltr: Approval of Revised FS under 5 Caveats	2
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01/04/89	37.00	George A. Gullage Raytheon	Glenn R. Kistner EPA Region 9	Submittal of Technical Report on Extracted Groundwater Use	28
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01/17/89	41.00	Phil Bobel EPA Region 9	Terrence J. McManus Intel	Ltr: Comments on RI/FS/EA for Intel Lot #3	2
01/17/89	42.00	Phil Bobel EPA Region 9	George Gullage Raytheon	Ltr: Authorization to work on RA at the DW-3 Well Cluster & Pumping and Treatment of Groundwater.	1
01/18/89	43.00	Sandy Olliges Ames Research Center	Glenn Kistner EPA Region 9	Ltr: On Behalf of NASA-Ames to Comment on FS	2
01/20/89	44.00	David C. Koehn Air Products	Glenn Kistner EPA Region 9	Ltr: Comments on Draft FS and Propose Selection of Remedy for the Site	3

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01/23/89	47.00	Thomas E. Hookano Crosby, Heafey, Roach & May	Glenn Kistner EPA Region 9	Ltr: Comment on FS of Cleanup Alternative on Behalf of Sobratoto	7
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01/23/89	53.00	Bert D. Denum Tracor	Glenn Kistner EPA Region 9	Ltr: Comment on Draft FS And Object Any Responsibility to Pollute the Site	3
01/23/89	54.00	Louise T. Lew U S Dept. of Navy	Glenn Kistner EPA Region 9	Comments on Draft FS Attached with Cover Ltr.	8
01/24/89	55.00	Roger B. James Santa Clara Valley Water District	Glenn Kistner EPA Region 9	Ltr: Comment on Proposed Plan Attached with Recommended Position of Santa Clara Valley Water District on IBM Remedial Action Plan	3
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02/22/89	60.00	Philip Bobel Chief-Remedial Br. Superfund Prog. EPA-9	Terry McManus Mgr-Corporate Environmental Affairs, Intel Corp.	Intel Comments on MEW FS.	2
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04/12/89	65.00	Canonie	George Gullage Proj. Coordinator Raytheon Co.	Rpt: Walker Drive Investigation RI/FS MEW Study Area Mtn. View, CA	46

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